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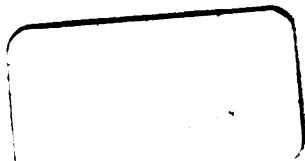
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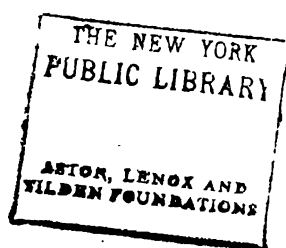
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ASIATIC RUSSIA





Traveling on a Boat-Raft in Northeastern Siberia.

Asiatic Russia

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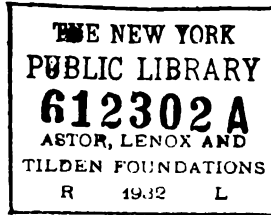
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ASIATIC RUSSIA

PART II

Russian Occupation

(Continued)

XIV

RUSSIAN COLONIZATION (Continued)

The Influence of the Church

THE Russian Church, whose influence is now so predominant throughout Siberia and the Russian settlements in Turkestan, differs from the Roman Catholic Church in recognizing the Council of Nicæa, which met A. D. 787, as the last of the ecumenical councils whose creeds have universal authority. Attention to the main points of divergence both in belief and practice between the Russian and the Roman Catholic and Protestant churches will help to an understanding both of the present condition of the people and of their prospects of future development.

1. The Russian Church rejects the papal supremacy, and does not profess to have made any infallible additions to the church doctrine since the last ecumenical council.

2. The Russian Church encourages the circulation of the Scriptures in the vernacular language, in which they are also read every Sabbath in the churches. Free range of interpretation and speculation is therefore given to all within the limits of the Scripture and of the creeds enunciated by the first seven general councils.

3. The priesthood of the Russian Church are compelled to be married, though they are not permitted a second marriage. Indeed, the priesthood has formed an hereditary class. Up to recent times the sons of the priests were expected to follow the calling of their fathers, and the daughters to marry priests; and even now, upon the opening of other careers to the children of priests, the old practice continues to a large degree. The bishops, however, are chosen from the monasteries, and are not allowed to marry.

4. The monasteries of the Russian Church are much more inclined to be simple retreats for private meditation and retirement from the world than for active propagandism, as in many of the Catholic orders.

5. The Russian Church uniformly aims to be the servant of the state, rather than its master. While the Roman pontiff has attempted to control the politics of Western Europe and to assert authority over the governments of every sort, the Russian Church has submitted itself to the Tsar, though it is by no means true, as some suppose, that the Tsar is the head of the church; for the central authority of the church is the Holy Council, whose members are from time to time appointed by the Tsar, being selected from prominent church dignitaries.

6. The Russian Church prides itself upon its spirit of toleration. As contrasted with the Roman Catholic Church, this claim may well be sustained, though Protestants would scarcely admit its truth. But Protestant churches as well as

Roman Catholic, stand side by side with those of the Greek Church in all the principal cities of Siberia. The exact statement of facts is, that the Russian government recognizes all churches which have an established position, but does not allow of proselyting, and for this reason seems intolerant to many ultra-Protestants. But the Armenian and Georgian churches in the Caucasus, and the Lutheran and Catholic churches in the provinces where they abound, are left in undisturbed possession of their rights and privileges; while even the more conservative portion of the Raskolniks have acquired a legal status which is measurably satisfactory. It is well known, also, that there are more Jews in Russia than anywhere else in the world, and these form an important element of the population of some parts of Siberia; while Mohammedans of all classes are permitted, and even encouraged, to retain their religious institutions.

At the same time the Russian Church has been active in its efforts to convert the heathen tribes to Christianity, though, it is said, with indifferent success, since the sparseness of the population throughout all Northern Siberia is such that it is well-nigh impossible to maintain adequate Christian institutions either for the propagation of the faith or for its conservation when once established. It is often asserted that the native tribes of Siberia who have become nominal Christians still retain, to a great degree, their heathen practices. This, however, it should be said, is more or less true of all ignorant and sparsely settled populations of all creeds and countries. But in the more thickly populated portions of Siberia the

traveler will find essentially the same religious conditions which prevail throughout Russia. There is the same prominent church with its gabled and graceful domes and mellow-toned bells; and the parsonage with its benevolent-looking priest with long uncut locks of hair and unshaven beard; accompanied by his wife and surrounded by a company of well-behaved children; attentive to all the wants of his parish.

On Sundays and holy days he will find the church crowded with reverent worshipers, not sitting in seats, for there are none to be found in the churches, but standing, and crossing and bowing themselves at the appropriate places in the liturgy which they all understand. All join in the worship in various ways,—some purchasing the bread that has been consecrated, others buying candles and passing them on to be set up and lighted before the picture of Christ or of some saint, while many are passing around during the entire service to kiss the painted feet of Christ, or to bow before the picture of some saint; while all listen with rapture to the responses of the trained musicians who recite the creed in the melodious harmonies composed by the greatest masters of sacred music.

It must be said, that the music in the Russian churches, rendered without instrumental accompaniment by choirs of trained and paid singers who are regular officials of the church has been written and harmonized with consummate skill and taste. Tschaikovsky, one of the greatest of modern composers thought it the highest part of his mission to perfect and enlarge the music of the church. To the farthest limits

of Siberia the peasant attending the Russian Church takes part in this beautiful ritual, becomes familiar with the Scriptures as they are read in his hearing, and with the historic creeds of united Christendom, and has his taste refined and his soul stirred by the most appropriate and truly artistic sacred music of the world.

Some of the most thrilling experiences of the traveler will be as he stands in these crowded congregations of rich and poor, official and peasant, in the churches of Central and Eastern Siberia, when all join in the strains of music with which they were familiar in giving personal and united expression to the deep religious emotions that move them in their isolated and distant new-made home, and when all for the moment seem transported not so much to the New Jerusalem as to the church in the village commune on the banks of the Volga or Don from which they have recently come. Along the line of the new railroad the Russian Church has also equipped a number of cars with all facilities for rendering the church service in the isolated stations along the line. I well remember meeting such a one in a newly established station in the Khilok Valley two hundred or three hundred miles east of Lake Baikal. The car with its officiating priests and singers was temporarily standing upon a side track, and our own train stopped long enough for a church service, though it was in the middle of the week.

To the Protestant there seems much excessive formality in the services of the Greek Church, but it cannot be denied

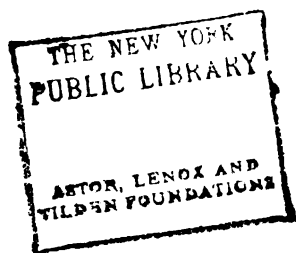
that it has a most powerful hold upon the minds of the peasantry, and indeed upon that of the educated classes; for the symbols are full of the significance of the religious system of which they are exponents, and convey to the minds of all the essential truths of Christianity; so that one feels everywhere among the Russian population in Siberia that he is in the presence of all the Christian standards of morality.

The Village Commune

The conditions of life throughout the Russian Empire cannot be understood without a clear conception of its most influential institution the village commune, or the *mir*. Under this organization there is a common control of all the landed property whether it is owned or rented by the commune. Annually a meeting of the entire body of voters, which includes not only all the adult male inhabitants, but all widows and women whose husbands are temporarily absent, is held and an elder (*starosta*) elected to serve, for the year, as chairman of the Village Assembly, in which all the real power resides. This Assembly apports the land in lots to each family according to its working units, care being taken to see that each family has its proper share of all kinds of land within the control of the *mir*; that is, each one will have his share of the richer arable portion and of the meadow lands, and his proper rights in the pasture and forest lands. A house lot and garden spot on the village street is also allotted to each family. As the families increase, and the younger members marry, a re-allotment has to be made; so as to give them a



Typical Siberian Peasant Face.



share in the common patrimony. Re-allotments are also necessary in case of the death or removal of the heads of families.

The theoretical difficulties attending the continuous working of such an organization are many and seemingly insuperable. But in practice the most of them have been obviated by the good sense and the kindly disposition of the Russian peasant. As has been said, the elder elected has no arbitrary power. In the case of any difficulty he calls the community together, and they discuss the matter; this they do in a very informal manner, it is true, but to good effect, collecting in knots here and there, and every one talking to as many as he can get to hear him. Sometimes these meetings will last for two or three days, until all have had opportunity to present their grievances both real and imagined, when finally the proposition will be submitted to a vote; and, such is the reverence of the peasant for the institution that, when a majority favors one of two alternate propositions, the minority always gracefully yields, and allows it to be unanimous. Thus the decisions of the mir, whatever they are, are by unanimous vote. Indeed, the peasant has come to look upon the voice of the majority of his fellow-citizens in the mir as the voice of God, which he dare not resist, and from which he has no heart to appeal.

There is much discussion as to whether the mir is a relic of very ancient times, corresponding to the tribal organization of savage people, or whether it has grown up in later times through its advantage of furnishing convenient units for governmental control. Its convenience in the present govern-

mental organization of Russia is certainly very great. The taxes in Russia are not collected from each individual directly, but from the mir, according to the number of its working units. Hence the whole village has an interest in the productive capacity of each unit of labor, and in consequence exercises a large degree of supervision of the unit. It thus comes about that freedom of movement on the part of the individual in Russia is interfered with, not so much by the central government, as by the local commune. If an individual leaves his mir, the mir continues to see that he still pays his part in the common tax. Hence he must get special permission to leave, and must keep the mir constantly informed of his whereabouts. This, however, is not looked upon by the Russian as altogether a hardship; for, so long as he pays his tax, he has the right to come back to his community and claim his share in the common allotment of land, and thus has a refuge always at hand in case of financial disaster, and a claim for support in time of old age. The prosperous mechanics and merchants in the Russian cities are for the most part careful and proud to keep up their membership in the village commune from which they have emigrated.

Another consequence of this communal organization is that the mir has power to judge and punish a large number of petty crimes, and even to ostracize its members who prove worthless and so would become an unmitigated burden upon the commune. Theoretically it would seem that such despotic power was a great infringement upon the natural rights of man. But practically the general good-heartedness, the appre-

hension of each one that he might be himself the subject of injustice, and the sympathies aroused in public discussions of the mir, bring the danger of unjust action down to so low a degree, that few have been disposed to question the general wisdom of the arrangement.

It is worth remarking, however, that many of the statistics widely circulated through popular channels to illustrate the arbitrary character of the Russian government in sending exiles to Siberia have grossly misrepresented the real condition of things by putting into one class all who have been exiled by what they call "administrative process"; that is, without formal trial before the regular courts. It was in this way that Mr. Kennan gave currency to a very serious misrepresentation of the facts, though his own figures when analyzed give any one who studies the matter carefully the means of getting at the exact truth. For example, he says that of the one hundred and twenty thousand sixty-five exiles, from 1880 to 1886, sixty-four thousand five hundred and thirteen, "or fifty-three and seven tenths per cent, had been tried and condemned by courts, and fifty-five thousand five hundred and fifty-two, or forty-six and three tenths per cent, had been banished by orders from the Minister of the Interior," adding that, according to the report of the Prison Reform Commission on an average fifty-four and four tenths per cent of all the exiles sent to Siberia went, not under sentences of courts, but "were banished by administrative process." In reading these statistics the casual reader most likely fails to notice that about ninety-nine per cent of those ~~reported as~~ banished

"by orders from the Minister of the Interior," are simply these derelicts and petty criminals whom the mirs, in the exercise of their sovereign power, have turned over to the general government to be deported. Moreover, when a criminal has served out his term of exile or imprisonment, it is left to the discretion of the mir to which he belongs to say whether he shall be received back again. If the mir refuses to receive him, the central government is compelled to return him to Siberia. Thus it appears that the arbitrary power in Russia does not lie altogether in the centralization of the government, but largely in its retention in the commune of the democratic elements characteristic of the early tribal organization of the human race.

Closely allied with the organization of the mir, or village commune, is that of the Russian family, in which almost unlimited authority is given to the father, resulting, also, in a general respect for the opinions of the aged; so that the word "elder" has more than a mere nominal significance. In the meetings of the village commune, the elders have always exercised a predominant influence, though it is said that since the abolition of serfdom a more independent spirit is coming to be manifest among the younger members. But among the strongest influences tending to maintain both the integrity of the mir and the patriarchal character of the family, is that of the conservative principles of the Raskolniks, or old believers, whose history we have briefly detailed. Everywhere these have sturdily resisted the tendencies to change the constitution and practices of the ancient family life and communal organiza-

tion. So far indeed have they carried this, that they have frequently found themselves in direct opposition to the government when it endeavored to take a census, to make a record of births and marriages, to levy a capitation tax, or to enforce a conscription.

The organization of the mir and the constitution of the Russian family have had great influence in the colonization of Siberia. The Siberian free colonists have not been to any great degree unorganized individual settlers, but they have gone in compact bodies, carrying the organization of the mir with them. Ordinarily their most trusted elders have been sent forward to select a desirable location, and to report upon it to the mir. Whereupon, if the report is acceptable, the entire village, with all their movable property and accumulated wealth, abandon their constricted quarters in the older settled portion of the country, and move as a body to the new fields that have been chosen. Here in virgin soil and with unlimited amount of land, free from many of the embarrassments arising from the encroachments of neighboring mirs and the constantly diminishing portion of land to be divided among their own increasing numbers, they set out upon a new career of prosperity in communal life.

The Siberian Home

The mir, or village commune, really the most characteristic thing in Russian society, has to a great extent been voluntarily transferred to Siberia; and indeed, wherever Russian agricultural colonists have settled in Asia; so that the Siberian

villages are scarcely more than repetitions of the Russian. In both cases the agricultural population is collected into compact villages, rather than, as in America, scattered about promiscuously upon separate and isolated farms; while in Siberia, as in Russia, the houses of the peasants are almost universally constructed of hewn logs, and are left unpainted. But almost always there are painted ornamental casings about the doors and windows. In both cases, also, the houses are usually arranged along both sides of an unpaved street at some distance apart, and surrounded with gardens. Nor are the streets usually shaded with trees, but are left exposed alike to the scorching summer's sun and the howling winter's storm. The Siberian woman, however, even more than the woman in milder climates, is fond of house plants, and their green leaves and brilliant flowers adorn every window-sill, lending attraction to the outside as well as to the inside of the humble structure.

The inside furnishing of the house is in keeping with the exterior. Usually there are three rooms, often, however, but one. In the principal room the prominent feature is a brick stove with an oven, which serves for heating the house, baking the bread, and taking the weekly hot steam bath, and furnishes upon the top a warm sleeping place during the long winter nights. A table, a bed, a bench running half way around the room, a cupboard, and several shelves complete the furniture of the single room. In case there is more than one room additional beds and benches and cupboards will be found

to meet the wants of the larger and more fastidious family and of its occasional visitors.

Altogether the house of the Russian peasant is well adapted for its purposes. It is cool in summer, and, when the cracks between the logs are well plastered and the whole thoroughly banked up with earth, is easily kept warm throughout the longest winter night by the generous fire in the brick stove. But, as it is made of wood, and, in the richest agricultural districts, thatched with straw, fires are frequent; it is estimated that in Russia ten per cent of the houses are burnt every year. Even in the cities the houses are principally made of logs, and are very combustible. In 1879 three fourths of the city of Irkutsk was burned to the ground, including most of the churches, three thousand five hundred of the buildings burned being wooden structures.

A favorite mode by which emigrants transport themselves down the Amur River is by means of the construction of a huge raft of logs which will safely carry the family and all their household goods, together with a number of domestic animals, and which, upon reaching their destination in the treeless portion of the prairies bordering the lower part of the stream, will furnish sufficient timber to construct a comfortable house without unnecessary delay.

Methods of Farming

The effect upon agricultural industries of the opportunity of securing unlimited land by emigration to Siberia is quite

similar to that which the opening of the Great West has had in the United States. In the older portions of the empire the denser agricultural population has thought it more advantageous to find relief in emigrating to virgin fields than in introducing scientific and expensive modes of increasing the production of fields whose fertility has been exhausted by primitive modes of cultivation. This process is also beginning to go on in Siberia, where the older settled portions are in many places already showing signs of exhaustion, and where, owing to the superabundance of land, the cultivation has been even less thorough than in European Russia.

Especially is the wastefulness of this process seen in the destruction of the forests which have been invaded in a promiscuous manner, not only to obtain logs for houses, but to obtain wood both for household purposes and for the numerous steamboats which are plying in increasing numbers upon all the rivers; and, now that the railroad is completed, for the locomotives. After the careless manner so characteristic of his prototype in America, the Siberian lumberman leaves the brush and other refuse of the trees to dry wherever it falls, and to become tinder ready to flash into flame in response to the sparks from the campers' fire, or from the ignited match of the careless smoker; so that in this manner incalculable damage is done to the forest preserves in the vicinity of all the new settlements; while, owing to the extreme dryness of the climate, the fires often extend to great distances. In Turkestan, which is almost treeless, forestry

laws are effective, and the systematic cultivation of trees is a prominent part of the industries fostered by the government. But in Siberia, as in the United States, the present necessity of such laws, and the needs of future generations are not keenly enough felt to secure the attention which they deserve.

The Mines

The colonization of Siberia has been delayed by the difficulty of transportation, and the consequent remoteness of markets. At first almost the only product which it was profitable to export was the furs obtained by the hunters; so that the market for the agricultural products of the early colonists was limited to supplying the necessities of the hunters and traders who passed backwards and forwards between Russia and the distant portions of the newly explored domain, and of the military guards which were stationed for their protection and for the preservation of Russian authority. Early in the eighteenth century, however, the mining interests of the Altai Mountains began to assume importance and were actively promoted by private capital. The mines of this region yielded considerable quantities of gold, silver, lead, copper, and iron, which not only furnished a ready means of exchange with the mother country for the manufactured articles of necessity and luxury there produced, but gave rise to a considerable amount of internal commerce, since many of these necessities could now be produced in close proximity to the agricultural districts. A glance at the map will show the effect of this de-

velopment of new industries in the rapid settlement of the upper valleys of the Obi and the Irtysh, in the vicinity of Barnaul, Biisk, and Semipalatinsk. The manufacture of iron on the tributaries of the Yenisei near Minusinsk also evidently had an appreciable effect in stimulating the agricultural interests in their vicinity by furnishing a most needed article of exchange near at hand. The same is also true of the iron industries early developed at Petrovsk on the Khilok River, two hundred miles east of Lake Baikal.

But in recent times the greatest stimulus to Russian agriculture has been the development of gold mines which has created a ready market for agricultural products in many of the distant provinces. These mines are specially productive in the Altai Mountains, and throughout the long and complex ranges which border the Sayan Mountains both east and west of the Yenisei, and extend all the way to Irkutsk. Of equal importance are the mines east of Yeniseisk, near the mouth of the Angara River, and, following down the Lena River, those in the middle and the lower portion of the Vitim, but especially of the Olekma River. The mines in Transbaikalia in the vicinity of Nerchinsk have been worked by convict labor for the government for two hundred years, thus furnishing a market for the abundant agricultural products of that region. In more recent times the extensive placer mines on the Upper Zeya River have afforded a market for the fertile agricultural district in the vicinity of Blagovestchensk and contributed largely to the rapid growth of that flourishing city.

Steam Transportation

Finally, the introduction of steam navigation, and the building of the Trans-Siberian railroad have greatly enlarged the opportunity for the exchange of agricultural products in Siberia. The first steamer built in Siberia was launched upon the Obi in 1843, but it was not until 1863 that one appeared on the Yenisei. Now, however, steamers are numerous on all the great Siberian rivers and their navigable tributaries. Whereas in 1846 there were but two river steamers in all Siberia, in 1898, there were two hundred and seventy-one, and the number has since been considerably increased. The amount of commerce passing to and fro between the Obi River and Russia increased with great rapidity during the last decade of the nineteenth century, as shown by the amount which passed over the railroads from Perm to Tiumen, which is the principal entrance from Europe to the Obi Valley. In the year 1866 this traffic amounted to only fifty thousand tons; but in 1890 it amounted to one hundred and thirty-three thousand, and in 1895 to two hundred and sixty-six thousand tons.

In the valley of the Yenisei the river steamers do little but meet the wants of strictly internal commerce, since the transit trade from there to Europe is small on account of the great distance. Even as late as 1888 there were but four steamers on the river with a traffic of only about two thousand tons, but in 1890 there were six steamers, and the traffic had increased to four thousand tons, while in 1898 the completion of the railroad had given such stimulus to traffic that there

were thirty-five steamers with a proportionate increase of tonnage.

The first steamer to navigate the Amur River was built by Muravieff on the *Shilka* in 1854 for the purpose of conducting his military expedition for the relief of the garrisons on the Pacific. Until 1870 none but government steamers navigated the Amur, at which date there were twelve. Private companies have since been organized, which in 1885 had forty-four steamers, but at the close of the century there were one hundred and sixteen, while upon the initiation of the Chinese Eastern railroad through Manchuria, twenty-five steamers were put upon the Sungari River to carry material to Harbin for its construction. Numerous steamers, also, are running up the Zeya, the Bureya, and the Usuri River. All this rapid development of steam navigation upon the Siberian rivers has created a rapidly increasing demand for agricultural products; while the demand was increased still further by the enormous number of laborers introduced for the construction of the Trans-Siberian railroad.

It is not surprising, therefore, that the closing years of the nineteenth century were marked by an enormous increase in the emigration to Siberia. At so slow a rate did this emigration proceed during the first century of Russian occupation, that in 1709 the Russian colonists amounted to no more than one hundred and fifty thousand; while a century later they were estimated to be only five hundred thousand. But, according to the Census of 1897, there were then no less than five million Russian colonists in Siberia, and immigration was

increasing at such a rapid rate that in 1900 the governor of Western Siberia estimated the number at that time to be considerably more than six million.

Immigration

The effect upon immigration of the improved means of transportation introduced during the last quarter of the nineteenth century is clearly seen in the few statistics we have, imperfect though they are. According to the estimates of Leroy-Beaulieu, gathered from official statements, between 1887 and 1895 ninety-four thousand families, or four hundred and sixty-seven thousand persons, immigrated to Siberia, being an average of fifty-two thousand persons a year. But the number was much larger during the latter portion of the period than during the earlier. In 1894 sixty-three thousand immigrants crossed the Urals, while three thousand four hundred and ninety-five entered the valley of the Amur and the Usuri by way of Vladivostok, sailing from Odessa. In 1897-98, however, the immigration increased to about two hundred thousand annually, a rate which has even been surpassed in subsequent years.

Previous to the opening of the railroad and during the use of steam for the navigation of rivers, the immigrants were in the habit of crossing the Urals from Perm to Tiumen, and thence going on steamers by way of the Tobolsk, the Irtysh, and the Obi River to Tomsk. In 1893, the year in which the railroad reached Omsk, out of sixty-three thousand immigrants, thirty-six thousand five hundred went by the water route, twenty thousand by wagons; while only six thousand five

hundred made use of the railroad. In 1894, thirty-eight thousand of the colonists settled in the government of Tomsk, going principally to Barnaul, Biisk, and Kusnetsk; seventeen thousand went overland to the Amur; three thousand eight hundred went into the steppe region of Akmolinsk and Semipalatinsk; and only two thousand one hundred into the provinces of Yeniseisk and Irkutsk; while two thousand one hundred stopped in Tobolsk, and three thousand eight hundred and ninety-five went from Odessa by the sea route to Vladivostok and the Usuri Valley. Upon the further completion of the railroad towards Irkutsk, there was a great increase of immigration into the valley of the Yenisei, colonists to the number of nineteen thousand settling in the vicinity of Minusinsk and Kansk in the year 1896. In the year 1897-98 the immigration increased, as just remarked, to more than two hundred thousand a year, which, added to the natural increase of population, made a total of about three hundred thousand annually. Those going to the Amur, if they went all the way by wagons, as they usually did, would be three years in making the journey. Often, however, they stopped upon the way, like ordinary nomads, to raise a crop of grain in the summer, and suffer their livestock to increase, or to work on the railroad, and thus get money to pursue their journey. Arriving at the headwaters of the Amur in the spring, they would descend it on rafts after the manner already described.

Everywhere along the line of immigration one is struck with the attention to the wants of the immigrant paid by the government. At Cheliabinsk and Kansk and Stryetensk large num-

bers of houses are built for their temporary accommodation, together with hospitals and kitchens, the hospitals being supplied with voluntary nurses. A limited amount of provision is also made for the comfort of those who may arrive in winter and be compelled to remain a longer time on account of the inclemency of the weather. Since the railroad is opened, the immigrants largely take advantage of this easier and more rapid means of travel. Fourth-class cars, such as are used for the transportation of the soldiers, are furnished at nominal cost, a few rubles paying for the entire transportation from Cheliabinsk to Stryetensk. These are indeed mere box-cars, but they are covered, and furnish space for the storing of household goods. Taking their bedding with them, the pilgrims find in these a means of travel which is far from uncomfortable. At every railroad station there is always a bountiful supply of hot water provided free of cost from which the immigrants can replenish their kettles and teapots, and at their leisure provide themselves with tea and soup.

In addition to these facilities offered for the inducement of immigration, the government makes a grant of forty acres of land to each male colonist, and advances at once and without interest thirty rubles to each family that needs it, and adds to this amount one hundred rubles more if it is deserved. While it is expected that this sum will be repaid in ten years, the collection is not pressed, if conditions have proved unfavorable to prosperity.

Notwithstanding the supervision of the government, there is always a considerable percentage of the colonists who be-

come dissatisfied and return to Russia. Through unforeseen circumstances the resources of some are consumed before they reach their destination, and they must be helped forward or backward. Many become homesick, especially among the women, and their importunities to return are very likely to prevail; while others complain of the weather, especially in the summer, and many are disappointed that they cannot live in the new country without work. At first the dissatisfaction is increased by the cool reception given them by the colonists who have preceded them, and whose liberties are to be curtailed by an increase of population, which means less common land for their cattle to range upon, a limitation of their opportunities to plunder the forests, and a general diminution of their original freedom. In 1894 four thousand five hundred colonists are said to have returned to Russia.

The tenure by which the land is held in Siberia varies much according to the newness of the country. Many of the first settlers have been content with what would be called in the western part of the United States mere "squatter's rights." As in the United States the entire domain is regarded as the property of the government, which alone can grant permanent titles. But so long as there was an unrestricted amount of land open to settlement and no survey had been made, the settlers were naturally content to cultivate as much as they needed wherever it was convenient, and, since it was all nearly of equal value and they did not make many permanent improvements upon it, a title was of little consequence. Indeed, it would in some respects be better not to have a title, since

then they could remove from wornout fields to virgin soil, and secure at any time a title to the choicest pieces which were left uncultivated.

But as the settlements have increased, the condition of things has more and more approximated to that in Russia. Whereas at first the commune did not need to apportion out the land to each family, because there was a superabundance for all, as time went on they have been compelled to limit the individual members to special lots, as is done in the mother country. For the most part, however, the communal system is adopted and the land titles are held in the name of the commune. But even yet the forests are so abundant and the pasture grounds so large that the restrictions of use relate for the most part to the meadows and the lands which are more desirable for cultivation.

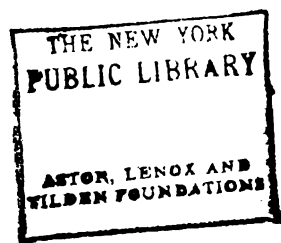
XV

THE EXILE SYSTEM

ANOTHER important element in the colonization of Siberia (though by no means relatively so prominent as is ordinarily supposed) consists of the exiles, who for one reason or another have been banished to the country. The process began almost immediately upon the first occupation by Yermak. As early as 1593 the murderers of the Tsar-evitch Dmitri, together with the bell which summoned them for the occasion, were banished to Siberia. But until the close of the seventeenth century scarcely any exiles were sent there, except such as had been guilty of insurrection, or of crimes directly aimed at the royal family. Up to this time, and indeed until the beginning of the nineteenth century, the statistics are too defective to permit even an approximate estimate of the number who were exiled. Toward the close of the seventeenth century, however, a large number of revolutionists who had to be subdued in Southern Russia were deported to Siberia; while, soon after, a formidable revolt of the Strielitz, or old National Guard founded by Ivan the Terrible, gave Peter the Great occasion to break the power of this formidable organization, which he did with an iron hand, executing many, and send-



Group of Convicts Condemned to Hard Labor.



ing a still larger number of the less prominent ones into exile in Siberia.

These insurrections of the Strielitz and the Cossacks in the south of Russia also partook largely of a religious character, being sympathized with and shared in by the Raskolniks, or Old Believers, who, as already said, were scandalized by the revolution which Peter was making, not only in the ritual of the church, but in the manners and customs and even dress, of the people. From that time onwards, no inconsiderable portion of the enforced exiles to Siberia and to the recesses of the Caucasus were of the more active or obnoxious members of the various dissenting sects, who, however, as already noted, were joined, or in many cases preceded, by voluntary exiles of their own class. This has resulted in furnishing Siberia a large number of industrious, moral, and thrifty colonists, who have, in their way, done for portions of the country what the Pilgrims did for New England, though they have been more hampered by the physical conditions surrounding them and have suffered from lack of educated leaders. Still one will find in many places in Transbaikalia the best representatives anywhere existing of the old Russian family organization, with its high standard of morality and with the prosperity which that and its accompanying industry and economy are sure to bring.

In 1758 large numbers of Poles were exiled, and again, after the revolutions of 1831 and 1863. Many courtiers of high rank whose presence in Russia was considered dangerous to the authority of the empresses Catharine I., the two Annes, and

Elizabeth Petrovna (who reigned after Peter the Great from 1725 to 1762) were sent to Siberia, while Catharine II. from 1762 to 1796 disposed of a large number of Polish confederates in the same manner. In 1825, upon the accession of Nicholas I., a desperate attempt was made by a revolutionary party to prevent his ascending the throne, but after much bloodshed they failed. Five of the leading conspirators were put to death under martial law, but a large number of their more active supporters were exiled to Siberia. Under the same emperor there was also a wholesale deportation of Poles to Siberia after the insurrection of 1831; while after the insurrection of 1863 it is estimated that Alexander II. deported as many as fifty thousand Poles to Siberia.

In consequence of the spread of Nihilism in the latter part of the reign of Alexander II., and of the numerous plots against his life (the last of them, March 13, 1881, resulting in his assassination), a large number of suspicious characters, more or less associated with the conspiracy, were exiled to Siberia; while, all along, the police have been active in efforts to ferret out and punish those who were conspiring in secret against the royal family or prominent ministers of state. However, except after the periods of Polish revolution, and at the close of the long contest with Schamyl in the Caucasus Mountains, when a large number of his followers were temporarily removed, the number of political exiles has been small, averaging only about fifty or sixty a year.

Nor has the condition of the political exiles in general been so deplorable as some have imagined. Only in exceptional

cases have they been condemned to hard labor or close confinement. Ordinarily they have been at liberty to pursue whatever avocations they desired, and to live in such style as their means would permit, having their wives and families with them. In reflecting upon their fate, it is important, also, to remember that the physical conditions of Siberia, which seem so repellent to the Western mind accustomed to a more genial climate, are, after all, substantially the same as those in Russia from which the exiles came. It should moreover be remembered that it is a very serious thing to undertake the violent overthrow of an established government, and that the persons who engage in such daring and hazardous enterprises are usually aware that they take their lives in their hands, and incur the risk of banishment or even the sterner punishment in case of failure, and hence are by no means the loudest to complain of their fate. They may rather, if exiled to Siberia, count themselves fortunate that they have not experienced a sterner punishment.

In justification of this view of the case, it may be noticed that the political exiles, as a class, have furnished some of the best elements of Siberian society. Many of them have devoted themselves to the scientific exploration of the country, and to the founding and building up of the interesting museums which enrich the life of all the principal Siberian cities. Banished to the far northeastern portion, they have gathered facts on the languages and the ethnology of the region which have furnished the key to the solution of the most puzzling and interesting questions concerning the connection of the tribes

of Asia and America, and often after their disabilities were removed, and their exile was over, they have voluntarily returned to complete their work for the fuller satisfaction of the scientific world.

Among the most interesting illustrations of the work done by the exiles in Siberia is that of Mr. M. Martianoff in Minusinsk, where he with Prince Alexander Kropotkin was exiled in 1877 for supposed complicity with the anarchistic societies that were plotting the assassination of the Tsar. Probably they were not guilty of any overt acts in connection with the terrible scenes of that period, but the conspiracies of that time were so wide-spread and deep and carried on with such secrecy that it was not at all strange that many who were simply critics of the existing governmental régime should be seized upon by the police. Indeed there was a condition of things in which it was often necessary to reverse the regular order of procedure and compel a man under suspicion to prove his innocence, instead of permitting him to wait until he was proved guilty. But, be this as it may, these two highly cultivated men found themselves exiled to Minusinsk,—a place which both proved a very delightful residence and furnished a field for the exercise of their rare scientific abilities. As we have already said in describing the country, it has the climate of Italy, and presents to the student most interesting problems in geology, botany, and archæology. In the freedom allowed them, both these gifted men devoted themselves with enthusiasm to investigations along all these lines, and laid the foundations for the remarkable museum which now forms the princi-

pal attraction of the place, drawing to it, indeed, for its study savants from the ends of the earth. Physically there was really no hardship attending their banishment, but the minds of the two men were very differently affected. Kropotkin became restive and despondent, rebelled against the most reasonable police regulations which were later introduced, and which scarcely interfered at all with his personal freedom, and at length committed suicide; while, Martianoff, when his disabilities were removed, had become so attached to the place that he chose it as a permanent residence, and is still the leading spirit in all the good enterprises of the city and district. When the present Tsar a few years ago passed through Krasnoyarsk, Martianoff was one of the guests invited to come down to meet him.

Extremely valuable contributions to ethnographical science have also been made by the exiles Bogeras and Yochelson concerning the Chukches; by Kudiyakoff, concerning the Yakuts, in the region of Verkhoyansk; by Mainoff, concerning the Buriats; by Schklovsky, concerning the natives of Northern Yakutsk; and by Tscherashevsky, concerning the Yakuts in general. All of these have received generous recognition from the scientific institutions of Russia; while the latter was awarded the gold medal by the Imperial Geographical Society. Especially have these educated exiles rendered valuable service by their meteorological observations at Verkhoyansk and other places in Northeastern Siberia. Among these may be specially mentioned, for their works since 1887 S. Kovalik and Voynarsky.

The contributions of A. L. Tschekanovsky to the geology of Northern Siberia are specially worthy of notice. This gifted man, having been banished to Siberia as a political offender in 1863, joined with M. Hartung to prosecute scientific investigations in connection with the long journey to his place of exile. He made for himself a magnifying glass from a broken decanter, and studied and collected on the way the various insects encountered, especially ants. Later, on the Angara River he studied the geology of the region, and made careful meteorological observations with instruments of his own construction. Being visited here by Dr. Fr. Schmidt, the distinguished savant of St. Petersburg, his work was brought to the attention of the public, and he was employed by the Eastern Siberian branch of the Imperial Geographical Society to conduct for them geographical observations in the province of Yakutsk. After spending the years 1870 and 1871 in their service he proposed a plan for extensive exploration of the unknown region between the Yenisei and Lena rivers. With the aid of funds contributed by this society and by private parties, two years were devoted to the execution of this plan, which was successfully carried out with most valuable results. In 1876 he was pardoned, and returned to St. Petersburg to arrange and classify the abundant material collected. But while planning another more extended exploring expedition into regions adjoining those where he had already spent so much time, his reason gave way, and in a fit of despondency he committed suicide. While one cannot but sympathize deeply with these men, the devotee of science cannot also fail to see

that their hardships were in the main such as are freely endured by all scientific investigators who endeavor to explore those far-off regions. So that the real additional hardships were mental, rather than physical.

Other political exiles, freed from the entanglements of the political and social movements at home, have become the trusted agents of the governments in Siberia, and often have more than redeemed the reputation which they had lost at home. In many places in Siberia the palatial residences which one sees on the most eligible building sites which abound on her noble rivers were built by exiles for their own use. The palatial residence of the present governor of West Siberia in Irkutsk was built by a political exile, and by him sold to the government.

Following in the wake of all the other nations of Europe, Russia in the latter part of the eighteenth century adopted the policy of sending into exile a considerable portion of her ordinary criminals. England, shut off, about that time, by the success of the American Revolution, from banishing her criminals to the United States, established her penal colony at Botany Bay, in Australia, and kept enlarging the system until the fairest portions of her possessions in the Pacific were filled with exiles. But the evils of the system grew to such gigantic proportions that the conscience of the English nation was at length aroused, and the revolting facts connected with it being brought to the notice of the public, the entire system was abolished in 1867. This was brought about, however, to a large degree, through the protests of the regular colonists,

who objected to having their communities made the dumping-ground for the criminal population of the mother country; while the experience of making Norfolk Island exclusively a penal colony led to results too horrible to be related. France, however, still clings to her penal colonies in New Caledonia and in various other lonely islands. But, in many respects, Russia would seem to have adopted the exile system under more favorable conditions than either France or England was able to provide. The Siberian territory adjoins that of Russia; so that, by sending prisoners of different degrees of guilt to stations located at proportionate distances from their home, there would seem to be better opportunity to secure the proper grading of penalties. At the same time the expanse of country was so immense that it was thought that under a considerable degree of freedom, and in connection with an entire change of conditions, it would be comparatively easy for the lesser criminals to reform and readjust themselves for a prosperous career. But an even longer experience than that of England has demonstrated the inherent and ineradicable viciousness of the system.

The task of maintaining proper supervision of penal institutions when near at home is notoriously difficult; so that flagrant abuses in prison management creep in, in spite of the utmost vigilance. The difficulty of supervision is greatly increased in Siberia by the distance separating the penal settlements in the remoter portions from the administrative center at St. Petersburg. The means of communication and of entertainment along the road being limited, and the number of prisoners

being uncertain and their movements irregular, congestion and overcrowding are often produced at certain points. This has been notably the case at Tiumen, where all the prisoners are concentrated for distribution to their several stations in Siberia. Mr. Kennan has presented the facts connected with this station in the most lugubrious light, though it is evident, from his own figures, that his conclusions are much exaggerated.

For example, the statistics to which he had access, and which had been freely published by the Russian government, show that from 1876 to 1886 the total number passing through the forwarding prison at Tiumen was two hundred and sixteen thousand three hundred and seventy-eight; while the total number of deaths for the period was two thousand eight hundred and sixty-seven. From this he reaches the conclusion that the average annual death rate was more than thirty per cent. If, however, the total number of prisoners for the year be divided by the total number of deaths, the ratio is one and one third per cent, which is less than one-twentieth of that given by Mr. Kennan. Mr. Kennan's percentage, however, is made up by dividing the average daily number of prisoners by the total number of deaths throughout the year, which manifestly gives an unfair representation. For, Tiumen being the first distributing point where the prisoners stopped for any time, the weaker ones and those most susceptible to disease were likely to be detained and thus give an average for that place which belonged to a good share of the year. There are no facts to show that the death rate among the prisoners the year

through is greater than that which prevails in many prisons of other countries.

Still, after all allowances are made, the overcrowded and unsanitary condition of the forwarding prison at Tiumen is a great blot upon the Russian system of administration. That it was due to negligence, rather than design, however, is clear enough from the fact that the figures are all drawn from official reports which were freely published. Evidently the abuse arose and continued through an inefficiency of administration which is not specially incident to the more highly centralized governments, but is likely to occur under any form of government. A parallel instance in the United States shows how similar evils may arise and flourish under the conditions of popular government which there prevails.

The State of New York has long prided itself on taking a foremost position in prison reform. Yet early in 1901 the New York Prison Association, in reporting upon its largest and best known prison, that at Sing Sing, reveals facts that are most distressing and humiliating. This prison was built in 1824 on "made land" only five feet above the water level of the Hudson River. Its

"stone walls are two feet thick, and its windows are narrow slits which admit sunlight only for a limited part of the day, when the rays are in a direct line; even then it only enters the corridors, and never, in seventy-five years, has it reached the cells. There are 1,200 of these cells, and nearly 1,400 prisoners. Thus, nearly two hundred cells have to be occupied by two men each, yet the cells are only three feet and three inches wide by six feet and nine

inches long, and a little more than six feet high. Each cell contains about 145 cubic feet of air space; while in no English prison may an individual cell contain less than 810 cubic feet of air space. All prisons of the old-fashioned Sing Sing type have been demolished everywhere in the British Islands. They belong to an unenlightened age. . . . The sanitary expert shows that the prisoners at Sing Sing are suffering from lung starvation. The prison has no ventilation, except when the windows are open, and the windows are always closed at night and in bad weather. Thus the prisoners do not get oxygen enough, by even small percentages. The drainage at Sing Sing is also defective; sewage backs up from the river into the main outlet, the atmosphere of the prison is reekingly foul and damp, and the water supply is under suspicion. As a consequence, tuberculosis is prevalent in the prison, and forty-eight cases of typhoid fever have broken out in a few months. The prison at Auburn is only less objectionable in its construction and arrangement."

And these are not places of mere temporary detention, like that at Tiumen, but for the permanent incarceration of long-time convicts in the most populous State of the Union.

In justice to Russia, it must be said, also, that she has never been deficient in her encouragement of prison reformers, and has always had among her official classes, as well as among her private citizens, numerous representatives of the most advanced students of prison discipline; while at all the principal centers where prisoners are congregated, hospitals have been established for their benefit, and private societies organized for the promotion of their welfare. Indeed, the heart of the Russian is peculiarly sensitive to suffering, and the prisoners, though exiled for crime, are everywhere looked upon as

"unfortunates," upon whom alms are freely bestowed from the very commencement of their journey at Moscow to their final destination, wherever it may be. The escaped prisoners are also sure to find sympathy and to obtain aid from the peasants of Siberia wherever they go. It is even said that in Northeastern Russia the peasants habitually leave a cup of water and some bread outside their doors at night for the benefit of any prisoner who may be endeavoring to escape.

At the same time, also, it should be remembered that a large part of the exiles—indeed all who are condemned to hard labor—are criminals guilty of serious offenses, and that an attempt, however imperfect, has been made to adjust their punishments to the crimes which have been committed; while strenuous efforts have all along been made to give the criminal an opportunity to redeem his past after the conclusion of his time of exile. To understand the full workings of the system, it is necessary, therefore, to go somewhat into detail.

The exiles to Siberia belong to several classes, the distinctions between which are clearly stated as follows in a recent report of M. Solomon, Director-in-Chief of the Prison Administration of Russia:

"Transported persons under the Russian system have been divided into two groups: First, those who suffer transportation as a penalty inflicted by the courts in virtue of the provisions of the penal code, and, secondly, those who are subjected to it as a measure of public security taken by administrative authority. Transportation by administrative decree is one of the consequences of the authority which the rural and other communes have exercised upon their numbers. It is

the right of the communes, under conditions established by law, to refuse to readmit into the community such of their members as have undergone a penalty depriving them of liberty and followed by a restriction of rights. It is their privilege, also, under the same procedure, to deliver to the authorities those of their members whom they regard as dangerous to public security and well-being."

This power of the mir to banish its objectionable members, which we have already commented upon, is peculiar to Russia, and is an exercise, as already said, not of the autocratic authority of the central government, but of the large democratic privileges still retained by the people, corresponding to the practice of the Greek republics in ostracizing their objectionable citizens. In fact, it is scarcely distinguishable in principle from the increasing exercise of "local option" which is characteristic of so many American communities who have come under the influence of reforms of various kinds.

There is no well-defined rule controlling this ostracism of its members by the Russian mir, except that, like all other actions of the communities, it must be done by unanimous consent. Naturally, therefore, the poor wretches who can find no one to befriend them among the sympathetic peasants of the Russian mir cannot form a desirable class of colonists. Being mostly vagrants to begin with, they continue to be vagrants when sent to Siberia. The most of those who are banished by this process are incorrigible drunkards or too lazy and shiftless to do their part of the work. In getting rid, therefore, of these parasites from their own borders, they but inflict them upon the suffering communities of Siberia.

It therefore sheds a flood of light upon the exile system of Russia to note, as already remarked, that about fifty per cent of all Siberian exiles consist of those who have been thus banished by neighbors and fellow-townsmen as unendurable nuisances in their native homes. For example, in the statistics given by Mr. Kennan for 1885, representing fifteen thousand seven hundred and sixty-six exiles in all, five thousand five hundred and thirty-six were relatives who voluntarily accompanied the exiles; while five thousand four hundred and seventy-seven were exiled by village communes or were vagrants whom the village communes had refused to readmit to their privileges after having served out their judicial penalty, which leaves four thousand seven hundred and fifty-three nearly all of whom had been sent away after trial for gross crimes. During the ten years from 1867 to 1876, the number banished by the communes was more than fifty per cent of the total number exiled. In the seven-year period from 1880 to 1886 the number banished by the communes was about forty-five per cent.

An element in connection with the Siberian exile system too often forgotten is that capital punishment, except under martial law, was abolished by Elizabeth in 1753, since which period all the murderers and highway robbers and burglars and incendiaries that other governments have been in the habit of executing, have been kept alive and sent to Siberia. Until recently, twenty years' confinement to hard labor was the limit for which they were sentenced, and even now, when life sentences are given, twenty years is the practical limit; while,

through various devices in connection with prison reform, even this term is considerably shortened. Naturally it cannot be expected that the prisons where this class of criminals are collected and congregated, for the whole nation, can be made altogether desirable places of residence. Of the two thousand, one hundred and fourteen prisoners in Kara in 1879, seven hundred and ninety-three were murderers, four hundred and nine had committed robbery with violence, thirty-eight were incendiaries, twenty-two had committed rape, forty-six were forgers, while six hundred and seventy-seven are set down as vagabonds, eighty-six as offenders against discipline and defaulters in public service, and seventy-three as "various." Of three hundred and seventy-eight prisoners sent to other places in the Amur Valley, among the men were one hundred and fifty-five murderers, thirty-nine highway robbers, seventeen thieves, nine who had committed robbery with violence, four who had committed arson, three counterfeiters, three who had been guilty of seduction, and three of incest. Among the women, twenty-eight had murdered their husbands, six had murdered illegitimate children, seventeen had murdered other persons, seven had committed arson, and one had committed highway robbery.

"In the convict island of Sakhalin on January 1, 1896, there were 6,703 hard-labor convicts, and 8,433 released convicts and exiles; to these must be added 1,323 women who followed their husbands, with about 4,768 children; and the free settlers, who numbered 2,838. There were nearly 19,060 acres under culture (by 12,479 persons). The total Russian population was 29,004; indigenes, 6,150. The actual expendi-

ture for the prisons reached in 1897 the sum of 13,414,578 rubles, of which only 876,000 rubles were obtained through the work of prisoners and convicts."

In general it is only the criminals of most serious classes who are sent to the far east. Formerly the mines of Transbaikalia, where their labor could be made profitable, were the principal centers to which those sentenced to hard labor and close confinement were sent, but latterly the Island of Sakhalin has been the chief place where such are confined. Here there are extensive coal mines which can be profitably worked by convict labor; while the situation of the island is such that it is doubly difficult for the convicts to escape.

It is due to the government also to say that the lugubrious accounts given of the transportation of the prisoners to their various places of destination are liable to give a false impression from the omission of some of the most important circumstances. Among these is the fact that the political prisoners, except it may be in a few cases of an aggravated character, are not chained but are for the most part transported in carriages as comfortable as those used by officers in traveling; while the journeys of the ordinary prisoners are made under conditions as easy as that of the hundreds of thousands of regular colonists who have chosen to emigrate to the country for settlement. The guards which are provided for the prison criminals are no more than are everywhere provided for that unfortunate and desperate class of people.

The fact seems to be that the objections to the prisons of Siberia are substantially the same that are urged against

prisons everywhere, and to get the right perspective one needs to read them in connection with the literature of the prison congresses in general where reformers are presenting the worst side of their cases for the sake of urging the public to action. The facts may all be true, but they only partially represent the case. They are such, however, as to make the good people of all nations ashamed of themselves and of the means which they employ to carry out their will. Even Prince Kropotkin, who has inveighed most loudly against Siberian prisons, protests still more strongly against the best model prisons of Western Europe. For example, after being for some months imprisoned at Clairvaux in France, he writes :

“In Siberia I had seen what sinks of filth and what hot-beds of physical and moral deterioration the dirty, overcrowded, ‘unreformed’ Russian prisons were, and at the age of nineteen, I imagined that if there were less overcrowding in the rooms and a certain classification of the prisoners, and if healthy occupations were provided for them, the institution might be substantially improved. Now I had to part with these illusions. I could convince myself that as regards their effects upon the prisoners and their results for society at large, the best ‘reformed’ prisons—whether cellular or not—are as bad as, or even worse than, the dirty prisons of old. They do not reform the prisoners. On the contrary, in the immense, overwhelming majority of cases they exercise upon them the most deteriorating effect. The thief, the swindler, the rough, who has spent some years in a prison, comes out of it more ready than ever to resume his former career; he is better prepared for it; he has learned to do it better; he is more embittered against society, and he finds a more solid justification for being in revolt against its laws and customs; necessarily, unavoidably,

he is bound to sink deeper and deeper into the anti-social acts which first brought him before a law court. The offenses he will commit after his release will inevitably be graver than those which first got him into trouble; and he is doomed to finish his life in a prison or in a hard-labor colony. I had said that prisons are 'universities of crime, maintained by the state.' And now, thinking of it at fifteen years' distance, in the light of my subsequent experience, I can only confirm that statement of mine. * * * And if before my condemnation I already knew that society is wrong in its present system of punishments, after I left Clairvaux I knew that it is not only wrong and unjust in this system, but that it is simply foolish when, in its partly unconscious and partly willful ignorance of realities, it maintains at its own expense these universities of corruption, under the illusion that they are necessary as a bridle to the criminal instincts of man." *

To give the right perspective to the facts about Siberian prisons, it will be helpful to quote from the reports of some of the prison authorities in the United States. The following is from the United States marshal at Fort Smith, Arkansas, in 1884:

"The building is about sixty feet square, outside measurement, and is divided by a partition wall through the center, making two cells. The bottoms of the cells are covered with flagstones, which are about two and one-half feet below the surface of the earth; length of cells, fifty-five feet; breadth, twenty-nine feet; height, about seven feet.

"There being but two cells of equal size, I am compelled to confine all criminals and those only charged with misdemeanors together in the same cell, without regard to age, charge, or physical condition. The youth of tender years, often charged with only a misdemeanor, is confined for months with the condemned murderer and desperado.

* *Memoirs of a Revolutionist.* pp. 467, 468, 470.

Besides this, we have no place to keep the sick and wounded separate from the wild, noisy, and unfeeling crowd around them. The number of pupils committed to this school of crime during the nine months ending June 30, 1884, was 454."

The following is from an address of the Governor of Ohio in 1886:

"I know a jail in my own State of Ohio that, if I could bring it here, would empty this house quicker than a fire, unless you stayed from a sense of duty. I know more than one such jail, but I know this one specially; and its condition is such as to disgrace every decent citizen of the county in which it is. Let me tell you what it is like, and then you can say whether there is not a call for John Howard to rise from his grave and look at the jails of Ohio. It is under ground; it has an open water closet; there are three cells on each side of the privy vault. Here may be immured honest men, not criminals only, but witnesses detained under the law of Ohio, too poor to give bond for their appearance—this in an enlightened Christian State. I pardoned three men out of it, because the county had failed in its duty to have a decent jail; and they were suffering in health. I know another about as bad. There is but one jail in all the eighty-eight counties in Ohio that is absolutely and completely fit for the purpose for which jails are constructed."

The following from a prison warden of an enterprising Western city might be duplicated almost any time from some other portion of the country:

"In the city in which I live, only a few weeks ago a lady of refinement, finely educated, of good personal appearance, and her daughter—a girl of sixteen—were accused of arson by some man who had sold them furniture on monthly instalments. They were arrested. Where

should they be carried? Our jail is under ground, poorly lighted, ill-ventilated with all the prisoners in one pen. Into this common jail were thrust this lady and her daughter, and by the delays of the law were there perhaps a month before the time of trial. On the day of the trial, it was discovered that it was a mistake, and that they did not burn the house at all. . . . A very decent young man was suspected of robbing his employer. I have not seen a nicer young man in a long time. He was as lovely a boy as is in any one of your own homes. After the boy had been contaminated in the jail, it came out that he had been innocent of the crime alleged against him. What is to be done with women who are arrested, with boy criminals, and with persons suspected of crime?"

It is the pretty general opinion of the prominent officers of the National Conference of Charities and Corrections in the United States that the worst things said about Siberian prisons can be easily matched in almost every State of the Union, and that while in many of the States the State prisons have been greatly improved, the county jails remain practically in the disgraceful condition in which they have been for a century past. Besides, in many of the States the custom of leasing out the prisoners to work for private parties is still in practice, leading to a condition of things that is deplorable in the extreme. The average number of prisoners engaged in laboring on the railroads in North Carolina in 1878 and 1879 was seven hundred and seventy-six, the deaths among these were one hundred and seventy-eight, or ten and one half per cent per year, eleven of these being shot while attempting to escape. A similar per cent of deaths was also reported for the leased convicts of Alabama. It is reported, indeed, from three other

States that "a prisoner can rarely be found to have survived ten years of this brutal slavery either in the prison or in the convict camp. In Alabama, in 1880, there were but three who had been in confinement eight years and one nine; while not one had lived out ten years' imprisonment. In Mississippi, December 1, 1881, among seventy-seven convicts then on the roll under ten years' sentence, seventeen under sentence of between ten and twenty, and twenty-three under sentence of between twenty and fifty years, none had served eleven years, only two had served ten, and only three others had served nine years. There were twenty-five distinct outside gangs, and their average annual rate of mortality for that and the previous year was over eight per cent."

Speaking with reference to the whole matter of prison reform, a prominent actor in it recently (1901) expressed himself as follows:

"When Mr. George Kennan was in Minneapolis, lecturing on the iniquities of the Siberian transportation system, I offered to show him within three blocks of his hotel, a prison which could match the horrors of the wayside prisons which he described. The American county jail system as it is practiced in most of our States is abominable to an astonishing degree. For example, there was maintained in Minneapolis for several years a county jail in which the prisoners were kept in a steel cage, and were exhibited like wild beasts in a menagerie. They slept in hammocks, four to six men in a cell six and a half by nine feet. By day they had the run of a corridor four by forty feet, for thirty men. They could not keep themselves free from vermin; they were forced into association with the vilest outscouring of the earth. In a county jail at Davenport, Iowa, I saw five insane

patients who were kept confined in a dark, unwholesome prison, receiving only such care as might be extended to them by their fellow prisoners. The county attorney of a prominent county of Illinois told me a few weeks ago that the prisoners in the county jail in that county, maintained a 'kangaroo court.' When a new prisoner came in, they instituted an inquisition to ascertain whether he had any money, and if he had any, they took it away from him and spent it for the general good. I myself discovered a similar 'kangaroo court' in a jail in Minnesota.

"In some States, as for example, Ohio, and Minnesota, laws have been passed requiring separate confinement of prisoners in county jails, and prohibiting the promiscuous association, but thus far these laws have been very inadequately enforced. It has been generally admitted by those connected with state prisons and police stations that their administration is discreditable to the country. There has been a revolution of the administration of State prisons in the past twenty to twenty-five years. Most of the State prisons in the northern States are wisely and humanely administered, with intelligent efforts for the reformation of prisoners. Cruel punishments have been abolished, prisoners have been graded, and the introduction of the parole system has proven a remarkable incentive to the acquirement of good character. I believe that our prisons are far more reformatory than ever before.

In the South the lease system has existed for a great many years. It is practically a form of legal slavery. There has been a steady growth of sentiment in the South against the lease system, and it has been abolished in some States and mitigated in others, but it is still a blot upon our civilization, and entails great cruelties."

On the whole, it seems that the prisoners in Siberia are treated as well as the circumstances permit. Generous provision is made for their food and clothing; their rations being

in fact considerably larger than those dealt out to the English prisoners; nor is the hard labor to which the worst criminals are subjected any more severe than that endured by the mass of ordinary workmen; while considerably more than one half of the exiles live in comparative freedom with only such slight police control as will prevent their leaving the district, and they are permitted to engage in whatever occupation they choose which is open to them. The scattering of so many prisoners over Siberia is therefore not so much an evil inflicted upon them as upon the country; for under whatever system the punishments were executed, the individual criminals would endure the suffering, so that we are not called upon in this connection either to discuss the broad principles of prison reform or to criticize the measures pursued by the home government for the detection and arrest of the criminal population; but are chiefly concerned with the bearing of the system upon Siberia. That this is unfavorable, there can be no question, and this the Siberians themselves have been quick to perceive.

When one considers the character of the mass of the convicts sent to Siberia, he will not wonder that there, as in Australia and Tasmania, the free colonists come to be bitterly opposed to the whole exile system; while the government itself could not avoid seeing that the development of the country is greatly hindered, rather than helped, by the influx of this class of population. The condition of things which had arisen is graphically set forth by Mr. Solomon in the report already referred to:

"Let me call attention to certain figures. From 1807 until 1899 Siberia received from European Russia 864,549 transported persons, including their families. If we confine ourselves to the last dozen years we shall see that Siberia has received in that space of time 100,582 transported persons, of whom 95,876 were males and 4,706 were females. Of the families of transported persons there were 155 husbands, 17,556 wives and 40,900 children. Siberia has thus received in the course of twelve years 159,191 individuals, one thirty-sixth of the whole population. If one takes into consideration the number of the transported only, without their families, we shall see that during that period Siberia has received for each fifty-seven inhabitants a criminal or a man recognized as more or less dangerous in the country of his origin. These figures permit us to draw certain important conclusions. 1. Transportation does not contribute to the colonization of a country, owing to the great preponderance of unmarried persons. 2. The number of vicious elements introduced into the country passes all reasonable proportion. Of the number of transported males, only 17,556 were married; the other 78,322, or $81\frac{1}{3}$ per cent were unmarried.

"These conclusions are completely confirmed by a detailed study of the conditions of transported persons. The number of transported persons residing in Siberia in 1898 was 298,574 individuals of both sexes. Half of these were criminals condemned to transportation under the criminal code, the other half under administrative authority. But they can hardly be distinguished one from the other. The opprobrium of their situation and the misery of their existence have reduced them to an absolutely uniform mass. The third of this mass, one hundred thousand men, escape all control. The place of their residence is unknown to the police. They steal on the highways and in villages, they beg and extort money in every way possible. In the summer they bivouac under the stars and conceal themselves in the forests of Siberia; in the winter they move toward the cities and use every

method to secure a lodgment in the local prisons. The second one hundred thousand are equally in a state of vagabondage, but they change their residence to find work. If they have not lost the habit of work, and if they preserve some spirit of honesty, they may succeed in establishing themselves again; if not, they soon augment the ranks of criminal vagabonds. Of the hundred thousand who are left, about 30,000 are cultivators of the earth and furnish an element of order. It is remarkable that this number corresponds to the number of transported married persons. The other 70,000 are workmen. So long as they are young and in good health they gain their daily bread. but when infirmity comes, many of them take to begging and often terminate their existence in prison, which they have avoided until that time.

"These figures are eloquent, but I might cite others which are still more eloquent, for I have seen that panorama of misery and of moral degradation; I have seen it unroll before me from the mountains of the Ural to the waves of the Pacific. I will only cite one telling fact. While the number of transported persons represents five per cent of the free population of Siberia it represents fifty-eight per cent of the population of the prisons of that country. *Sapientia sat.*"

In view of these facts, it is gratifying to know that the dawn of the twentieth century was signalized by a radical change in the whole exile system. On the twenty-fifth of June, 1900, an Imperial edict was issued of far-reaching significance with reference to the system. The essential points are thus summarized by Mr. Solomon:

"1. Crimes and misdemeanors under common law which according to the penal code in force entail transportation under its different forms, will hereafter be punished by imprisonment of from eight months to two years, or by sentence to a house of correction from one and a half to six years.

"2. The provisions of the penal code concerning transportation for political crimes and for criminal acts against the laws and institutions of the Orthodox Church will be preserved, but Siberia will not be the only place for such transportation.

"3. Vagabonds refusing to disclose their identity, who are for the most part escaped convicts, after having suffered imprisonment in a house of correction for four years, will be transferred to the island of Sakhalin.

"4. The right of the communes, both rural and bourgeois, to refuse readmission to members who have suffered a penalty deprivative of liberty is abrogated.

"5. The rural communes (but not the communes bourgeois) will retain the right to deliver to the authorities such of their members as are dangerous to public security. The place of their residence will be fixed by the administration; but they may, with the consent of the local police, leave that place on condition that they do not return to the province from which they have been expelled. After five years of good conduct they may ask the Minister of the Interior to remove that restriction.

"Transportation will be confined to political and religious criminals, the number of whom does not average more than a hundred individuals a year, and to vagabonds, not identified, the average number of whom is 430 a year.

"The Council of the Empire, in submitting to his Majesty the Emperor the scheme of law for the suppression of transportation, expressed itself in these words: 'The Middle Ages left to Russia three legacies: torture, the knout, and transportation. The eighteenth century abolished torture, the nineteenth the knout, and the first day of the twentieth century will be the last of a penal system based upon transportation.'"

PART III
Political Divisions

XVI

TRANS-CAUCASIA

TRANS-CAUCASIA is that portion of the Russian Empire lying south of the Caucasus Mountains and between the Caspian and the Black Seas. It includes the governments of

	Area: English sq. miles.	Population 1897.	Density per sq. mile.
Baku	15,095	789,650	55
Black Sea	2,836	54,228	.....
Daghestan	11,332	586,636	58
Elisabethpol	16,721	871,557	52
Erivan	10,075	804,757	101
Kars	7,308	292,498	43
Kutais	13,968	1,075,861	54
Tiflis with	15,306	1,040,943	62
Zakataly	1,541	.....	.....
Total	94,182	5,516,139	64

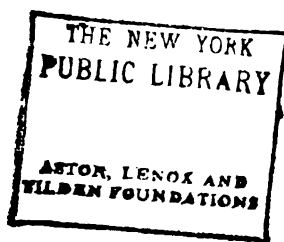
The astonishing variety of population may be appreciated by a bare enumeration of the nationalities represented in the census.

Russians	122,257
Poles	3,735
Germans	9,356
French	18

Moldovians	1,206
Greeks	55,707
Persians	10,687
Tatui	124,683
Taluishin	50,510
Ossetes	76,445
Kurds	100,043
Armenians	939,131
Gypsies	725
Jews	34,336
Chaldeans	2,272
Georgians-proper	381,208
Tushin	5,624
Pshavs	9,155
Chevsurs	6,560
Mitylenians	2,324
Imeritians	423,201
Guriets	76,095
Adzarts	59,516
Engelians	8,827
Mingrelians	213,030
Lazas	1,781
Swannetians	14,035
Abkhassians	60,445
Circassians	3,971
Chechenians	917
Kistins	2,150
Ingush	3
Lesghians	596,034
Tartars	1,139,659
Turks	70,226



Oil-Well at Baku.



TRANS-CAUCASIA

345

Turkomans	8,893
Karapapans	24,134
Nagaitzians	2,556
Kumians	60,838
Finns	1,382

Religiously the population consists of Orthodox, 1,395,473; Sectarians, 55,157; Armenian-Gregorians, 932,275; Armenian Catholics, 32,692; Roman Catholics, 6,910; Lutherans, 10,941; Jews, 36,291; Sunnite Mohammedans, 1,416,279; Orthodox Mohammedans, 882,753; Jesuits, 14,498; other religions, 16,291.

The births in 1898 were, males, 87,965; females, 74,984; total, 162,949; while the deaths were, males, 56,874; females, 47,458; total, 104,332; making an increase for the year of 58,617, or a little over one per cent annually.

Of agricultural products of 1898 there were reported 34,210,458 bushels of winter wheat; 8,628,462 of summer wheat; 103,242 of rye; 219,204 of oats; 22,405,056 barley; 2,810,664 millet; 12,993,906 maize; 1,442,202 potatoes; 7,741,392 rice; 825,852 other grains, making a total of 91,380,438 bushels.

The manufactured products for the various districts, estimated in rubles, is shown in the following table, the ruble being about fifty cents:

Tiflis	9,696,000
Kutais	7,970,000
Elisabethpol	4,513,000
Baku	29,989,000
Erivan	1,251,000

Kars	691,000
Daghestan	246,000
Total	54,356,000

The educational interests are displayed in the following figures: The number of pupils attending boys' gymnasia, 6,753; of these, 2,786 are Russians; 969 Georgians; 1,968 Armenians; 212 Tartars; 279 Jews; 539 other races. Of the church schools of the same grade, 3,830 boys attended the Orthodox schools; 1,906 the Armenian-Gregorian; 289 the Catholic; 150 Protestant; 265 Jewish; 288 other schools. Boys attending family schools, 3,240. The number of girls attending the gymnasia was 8,151, of whom 4,326 were Russians; 1,095 Georgians; 1,830 Armenians; 25 Tartars; 320 Jews; 511 other races. Of these 5,513 are Orthodox; 1,796 Armenians; 288 Catholics; 170 Protestants; 317 Jews; 67 other sects. In family schools, 3,813. In public schools, 10,577; of whom 6,972 are Russians; 2,792 Georgians; 2,908 Armenians; 547 Tartars; 172 Jews; and 606 other nationalities. In family schools, 1,187. In primary schools, 44,367; of which 5,273 were Russians; 19,079 Georgians; 12,007 Armenians; 3,078 Tartars; 1,020 Mountaineers; 263 Jews; 3,647 other tribes. Religiously, these were Orthodox, 24,048; Armenian-Gregorian, 11,783; Catholic, 1,178; Protestant, 2,130; Jewish, 303; Mohammedan, 3,369; other sects, 1,256. Altogether there was expended for education by the government, 1,076,257 rubles.

XVII

THE STEPPE

1. Akmolinsk

AKMOLINSK is situated between the forty-fifth and fifty-fifth parallels of north latitude, and the eighty-fourth and ninetieth meridians of east longitude. It is bounded on the north by Tobolsk and Tomsk, on the east by Semipalatinsk, on the south by Syr Daria, and on the west by Turgai. It has an area of 229,609 square miles, with a population of 678,957, of whom 354,370 are males, 324,587 females. Its principal cities, each of which is capital of a province, are Omsk, with a population of 37,470; Akmolinsk, 9,557; Atbazarsk, 3,034; Kokchetaf, 4,994; Petropavlovsk, 20,014.

The southern part of this province lies in the Aral-Caspian depression, and is watered by the Sarai-su, which, after running southward a distance of five hundred miles, empties into the inclosed salt marshes of Aitsi-kul, just over the border in Syr Daria. Many other shorter streams flow part way down this southern watershed, and disappear in a similar manner. The watershed between the Aral-Caspian basin and the tributaries of the Obi consists in general of a broad swell in the

earth's surface, averaging less than one thousand feet above the sea, but with occasional granitic peaks running up to a height of from two thousand to four thousand feet. These are flanked by sedimentary deposits, which also appear in extensive areas on the intermediate portions of the plateau, and contain coal deposits of much value. The western boundary is formed by a low range of hills similar to those which mark the northern watershed. The entire southern portion is unfavorable to agriculture, but gives support to a considerable nomadic population of Kirghiz Tartars. Fully three fourths of the entire population are nomads. The character of the southern portion is well indicated by its name, "Golodnaya," or "Hungry Steppe."

The northern part of the province lies largely between the Ishim and Irtysh rivers, and contains most of the settled population. But both near the watershed and upon its northern side there are numerous salt lakes which have no outlet, several of them being of considerable size. Its undulating surface is chiefly covered with "black earth," making it really an eastward extension of the fruitful plains of Southern Russia.

The climate of the entire district is severe, the thermometer rising to 104° in summer, and sinking to —35° in winter. At Omsk the Irtysh river freezes in October, and the ice does not break up until April; while the dates are about the same for the Ishim. The average rainfall is eleven inches, mostly falling in June and July.

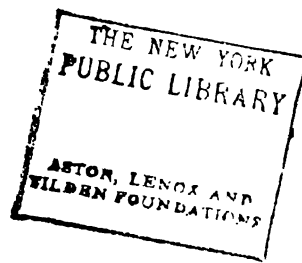
The province is almost entirely devoid of forests, but the problem of procuring fuel has been partially solved by the



(Another) Typical Siberian Village Street.



A Market Scene in Omsk.



discovery of coal over a considerable portion of the watershed. Copper and gold are also found to a limited extent, and salt is obtainable from the numerous inclosed lakes and lakelets.

Of agricultural products there were reported in 1897, 61,421 cwt. of winter wheat, 1,658,554.4 cwt. of spring wheat, 591,700.4 cwt. of oats, 201,431.2 cwt. of potatoes.

Of livestock there were 876,610 horses, 583,256 horned cattle, 1,850,231 sheep, 145,335 goats, 15,876 swine, and 102,551 camels.

The products of the chase amounted to 3,700 wolf skins, 2,500 of fox skins, 111,000 marmots, 35,000 hares, 7,000 skunks, 11,000 panthers, 1,100 martens, and of birds, 870 swans, and 7,800 geese, having a total value of 59,325 rubles. The salt collected amounted to 124,000 cwt.

The manufactured products were valued at 1,289,108 rubles, of which the brick were valued at 105,365; iron ware, 120,495; tobacco, 28,870; tallow, 408,997; sheep skins, 107,809; goat skins, 184,281; woolen fabrics, 135,000; sheep's intestines, 34,600.

The trade mostly passes through Omsk and Petropavlovsk, which are on the line of the Siberian railroad, at the crossing of the Irtysh and Ishim rivers. In Omsk, 519 establishments did business to the amount of 28,132,050 rubles; while in Petropavlovsk the transactions of 548 firms amounted to 3,523,965.

The higher educational work of the province is represented by 196 classical schools, in which there are 7,619 boys, and 2,902 girls, 10,521 in all.

2. Semipalatinsk

This province lies between the forty-fifth and fifty-third degrees of north latitude, and between the seventy-second and eighty-fifth of east longitude. It is bounded on the north by Tobolsk and Tomsk, on the east by Tomsk, on the south by China and Semirechensk, and on the west by Semirechensk and Akmolinsk, having an area of 184,631 square miles, with a population of 685,197, of whom 364,839 are males, and 320,358 females. Its principal cities, each of which is capital of a district, are: Semipalatinsk, with a population of 26,353; Zaisan, 4,471; Kokpek, 2,908; Karkaralinsk, 4,415; Pavlodar, 7,730; Ust-Kamenogorsk, 8,958. Administratively it belongs to the government of the Steppes. Its southeastern portion stretches well up into the Altai Mountains on one side of the Irtysh River, and follows the axis of the Tarbagatai on the other side; the river itself forming one of the main channels through which communication has always been kept up between Siberia and Mongolia.

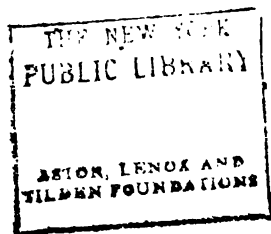
Near the southeastern border Lake Zaisan occupies an enlargement of the river fifty-six miles long, and averaging thirteen miles in width, covering an area of seven hundred square miles, but its depth nowhere exceeds forty feet, averaging about twenty-five. Like all the lakes in this region, this was formerly much more extensive than now, as is shown by old shore lines. The lake abounds in several varieties of valuable fish, and is surrounded by broad plains on every side, over which one can see the snow-clad mountains of the Altai range on the east, and the lower peaks of the Tarbagatai on the



Scene in Verni.



A Camel in the Market-Place at Omsk.



west and north. A long line of rapids too swift to be navigable, extends from Lake Zaisan to Ust-Kamenogorsk, whence the river flows northward by a gentle grade through ever-broadening plains, to the Arctic Ocean. The mountainous tracts contain all kinds of crystalline rocks, inclosing in their folds extensive areas of Secondary and Tertiary strata, and abound in rich gold-bearing sands, with silver, lead, and graphite, and in some portions copper. Coal is also found in considerable quantities on the flanks of the Tarbagatai range and in the steppe region to the west of the Irtysh.

The Irtysh River flows for a distance of seven hundred and sixty miles within the limits of the province, and, except through the rapids above Ust-Kamenogorsk, is freely navigated; while rafts are floated the entire length. Steamers ascend, also, a hundred miles above Lake Zaisan into the Chinese province of Sungaria.

The valleys of the Kurtschum, the Naryn, and Bukhtarma coming down from the Altai Mountains are rich agricultural districts. Forests also abound in all the mountain districts, the logs being floated down the streams to supply the wants of the vast treeless prairies of Western Siberia.

Lake Balkash lies upon the southwestern border, but its shores are practically uninhabited. This formerly received several tributaries from the Jenghiz Tau range, which connects the Tarbagatai Mountains with the northern rim of the Aral-Caspian basin, but these streams no longer reach the lake, illustrating, with many similar phenomena, the fact that this whole region is going through a process of rapid desicca-

tion. The broad plains on either side of the Irtysh below Semipalatinsk are dotted with small lakes having no outlet, many of which dry up in the summer, and all of which are salt.

According to the last census, the chief agricultural productions were: Rye, 53,072.8 cwt.; wheat, 861,907.6 cwt.; oats, 298,018 cwt.; millet, 148,825.6 cwt.; barley, 31,246.8 cwt.; peas, 2,236.8 cwt.; potatoes, 86,728.8 cwt.

Of livestock there were 822,013 horses, 452,108 horned cattle, 2,392,589 sheep and goats, 73,889 camels, but only 1,071 swine. From bees were collected 457.2 cwt. of honey and 86 cwt. of wax.

In the gold mines there were washed 36,850,520 cwt. of gold-bearing sand, which yielded 20,624 ounces of gold, having a value of \$371,232.

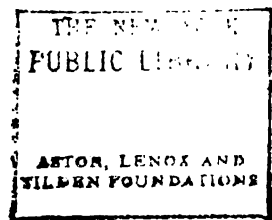
The estimated value of the merchandise exchanged in their various markets was 2,060,749 rubles.

3. Semirechensk

This province lies between the 42d and 47th parallels of north latitude, and between the 70th and 82d degrees of east longitude. It is bounded on the north by Semipalatinsk, on the east by the Chinese provinces of Sungaria, Kuldja, Aksu, and Kashgar, on the south by Kashgar and Ferghana, on the west by Ferghana, Syr Daria, and Akmolinsk. It has an area of 152,280 square miles, and a population of 990,107, of which 531,363 are males, and 458,744 females. Of its towns, Verni



A Favorite Cart in Central Asia.



has 22,982; Tarkent, 16,372; Lepsinsk, 3,232; Kopal, 2,842; Pishpek, 6,622; and Prshevalsk, 7,984. Each of these towns is the capital of a district. The province is watered by the numerous branches of the Chu, which come down from the Alexandrovskii range, by those descending from the Western Ala-tau range to the middle portion of the Ili River, and by the Seven Rivers descending towards Lake Balkash from the Eastern Ala-tau range, which from their number have given their name to the province, which literally means Seven Rivers.

In its southern portion the province includes Lake Issyk-kul and the upper portion of the Naryn River, which flows into the Syr Daria, and is bordered by the main ridge of the Tian-Shan range, over which the passes to Aksu and Kashgar, which have already been described, are of great height and difficulty. The Naryn stretches for a considerable distance up the flanks of Khan-tengri, whose elevation is 24,060 feet, from whose glaciers the river Tekes, one of the principal tributaries of the Ili, has its source. Numerous peaks in the Ala-tau and Alexandrovskii ranges rise to heights of from 10,000 to 15,000 feet. A low mountain range, also, branches off to the north from the Western Ala-tau, extending nearly to the western end of Lake Balkash, and gradually diminishing in height towards the north. On the eastern side, the Tarbagatai Mountains, some of whose summits reach 10,000 feet, form the boundary line, running southeast and northwest. These numerous, complicated and lofty mountain masses furnish an

abundant supply of water to the bordering terrace of loess which is everywhere found at their base, at an elevation of from 2,000 to 3,000 feet.

The central axes of all the mountains are composed of granitic rocks, but the synclinal troughs between them contain large areas of sedimentary rocks ranging from the Silurian to the Tertiary. Gold and silver are found pretty generally in the older sedimentary rocks near their junction with the granitic axes of elevation; while iron is found in many places, and coal of good quality is found in the sedimentary strata of Jurassic and Tertiary age in the Ala-tau range east of the river Chu, and about its headwaters in Kuldja.

Of agricultural products the annual yield of wheat is 305,437.2 cwt.; rye, 31,246 cwt.; barley, 106,697.2 cwt.; oats, 230,286 cwt.; millet, 136,059.6 cwt.; peas, 8,707.2 cwt.; rice, 6,679.6 cwt.; potatoes, 11,766.8 cwt.; flax, 20,494.4 cwt.; hemp, 6,354 cwt.; sunflower seed, 10,646.8 cwt.; mustard seed, 15,240.8 cwt.; clover, 742,920 cwt.; sesame, 149,285.6 cwt.; hay, 4,889,348 cwt.

Of livestock, there were 670,750 horses, 352,172 horned cattle, 98,673 camels, 4,176,429 sheep, 274,001 goats, but only 42 mules and asses. There were also 58,050 hives of bees, producing 7,783.6 cwt. of honey, and 424 cwt. of wax; while the candle-makers, soap-makers, tanners, millers, tobaccoists, and various others were producing products valued at 2,587,706 rubles, and the imports amounted to 1,036,877 rubles.

The educational interests are represented by a classical

"gymnasium" or high school for boys containing 245 pupils, for girls 160; six secondary classical schools for boys with 705 pupils; two secondary classical schools for girls, with 187 pupils; twenty-four parish classical schools for boys and girls with 1,154 pupils; and six for girls alone with 221 pupils; five competitive schools for boys and girls with 343 pupils; fifteen church schools for boys and girls with 610 pupils, and fifteen church grammar schools with 563 pupils. These, with a few private schools, numbering in all eighty-two, have an attendance of 3,381 boys, and 957 girls, making in all 4,338. In native schools there are in attendance 5,436 boys, and 1,516 girls, making a total of 6,952.

4. Transcaspian Province

This province lies between $35^{\circ} 17'$ and $45^{\circ} 30'$ north latitude, and the forty-eighth and sixty-third meridians of east longitude. It is bounded on the north by the Caspian Sea and Uralsk, on the east by the Aral Sea, Amu Daria, and Bokhara, on the south by Afghanistan and Persia, and on the west by the Caspian Sea. Its area, exclusive of the Caspian Sea, is 214,237 square miles, with a population of 372,193, or less than two to the square mile. Nine tenths of the area is covered with inhospitable sandy deserts, over which the annual rainfall is less than four inches. The population is chiefly centered in the oasis of Merv, near the termination of the river Murghab, and that at the termination of the Tejend, and in the "Atok," to which reference is so frequently made, a belt of irrigated land ten or fifteen miles wide, stretching along the northern

base of the Kopet Dagh range, through Ashkabad to Kizil Arvat, and thence southwestward to the mouth of the Atrek River. The Transcaspian railroad passes east and west through Merv, and thence through the Atok to Krasnovodsk, on the Caspian Sea. From Merv a branch railroad is built southward along the valley of the Murghab to the border of Afghanistan on the direct road to Herat. This is to form a link in the contemplated road to connect the Russian provinces in Central Asia with the Persian Gulf, a distance of only about eight hundred miles.

The northern part of the province between the Aral and Caspian seas, consists of the low desert plateau of the Ust-Urt, which is seven hundred feet above ocean level.

According to the last census, there were in the province 211,839 camels, 50,443 horned cattle, 105,136 horses, 3,353,788 sheep, 18,936 mules.

Of agricultural products there were raised, of wheat, 931,023.2 cwt.; barley, 176,799.6 cwt.; sesame, 15,258.8 cwt.; millet, 5,254 cwt.; rice, 800 cwt.; making a total of 1,129,135.6 cwt., of grain. Cotton, also, is cultivated to an increasing extent. Beginning in 1890 with 8,000 cwt. of raw cotton, it increased to 78,400 cwt. in 1894; 212,502 cwt. in 1896; and 248,800 cwt. in 1897, the most of it being raised in the districts of Tejend, Merv, and Murghab. Hay, also, was among the most important products, Tejend furnishing 470,000 cwt., and Merv 400,000 cwt.

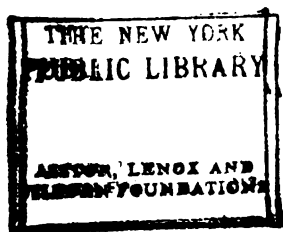
The fisheries of Mangishlak returned 15,784.4 cwt., and those of Krasnovodsk, 31,806 cwt.; while 26,490 seal were



A Post Station in the Steppe.



A Kirghiz Family Preparing for the Winter.



caught. The exports into Bokhara were valued at 3,075,000 rubles, of which 870,000 worth were manufactured cotton, 247,000, lumber, 204,000, kerosene, 254,000, granulated sugar, 137,000, tea. The exports to European Russia and the Caucasus were valued at 5,630,000 rubles, of which 4,743,000 worth was cotton, 242,000 wool, 194,000 dried meat and fruits, and 155,000 sheep skins dressed and undressed.

5. Turgai

The province of Turgai lies between the forty-fifth and fifty-fifth degrees of north latitude, and the fifty-fifth and sixty-seventh meridians of east longitude. It is bounded on the north by Orenburg, on the east by Akmolinsk, on the south by Syr Daria and the Aral Sea, on the west by Uralsk and Orenburg, and contains 176,219 square miles, with a population of 453,123. It lies largely within the limits of the Aral-Caspian basin, but includes in the northwest the Mugojar Hills, which are an extension of the Ural Mountains, but nowhere rising more than 1,000 feet above the sea. Between it and Akmolinsk, also, there is a range of low hills separating the Turgai River from the Sarai-su. Between these hills near the fifty-first parallel there is an east and west extension of lower hills, forming the bridge connecting the mountain systems of Central Asia with the Urals, and belonging to early geological formations.

North of this bridge are the extensive plains about the headwaters of the Tobol River, which are covered with an innumerable number of small lakes having no outlets. South of the

"bridge" the border of the Aral-Caspian basin is here formed by a range of precipitous crags which seem clearly to mark the old shore-line of the Aral-Caspian Sea. The broad channel between the eightieth and eighty-second meridians connecting the Aral-Caspian depression with the Arctic basin, is less than nine hundred feet above the sea. South of this watershed the Turgai plains are only about three hundred feet above sea-level, and are also dotted with numerous small lakes with no outlets. Evidently, in very recent times, this whole region was covered with water, of which abundant evidence is contained in the remains of aquatic plants which are everywhere found buried in the alluvial soil, and in the shells of *Mytilus* and *Cardium*, which still abound in the Aral Sea. In comparatively recent times, also, the Turgai and Irgiz rivers flowed in a broad current to the Aral Sea, but now their waters reach no farther than Lake Chel-Kar Tingez, which is surrounded by the sandy wastes of the Kara-kum, and is more than one hundred miles distant from the sea.

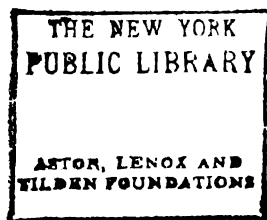
The climate of Turgai is so dry, and the extremes of temperature are so great, that forests do not grow except in the protected localities of the hilly regions. In the spring the loess plains of the north are covered with a luxuriant growth of grass, and immense numbers of geese and cranes are detained for a while in their northern migration by the numerous lakes which cover the area. In the middle and southern portions only the coarser kinds of grass and scraggly clumps of wormwood and other similar shrubs succeed in living; while large areas are covered by shifting sands and salt clays occupy-



A Sart Girl in Tashkent.



Grain Exchange in Samarkand.



ing the beds of recently dried-up lakes; for the process of desiccation is even yet rapidly going forward. Around the lakes still existing there are usually found a densely bordering thicket of rushes which serve as the protection and hiding-places of wild boars.

The population of the province consists almost entirely of Kirghiz Tartars, belonging, like those of the Uralsk, to the Small Horde. They numbered in all, according to the last census, 453,123, of whom 19,527 were in towns, the rest being nomads. The males exceed the females by 22,101. The chief occupation is cattle-breeding, but the occasional occurrence of abnormally cold winters with storms of sleet which render the winter pasturage inaccessible to animals, is a great drawback to the prosperity of the people. In recent time, however, efforts have been made to collect large communal stores of hay against periods of special want. In winter, also, large numbers of the flocks and herds are driven south to the milder and more protected pasture lands of the Syr Daria. According to the census of 1896, there were in possession of the nomads of the province, 455,236 horses, 304,766 horned cattle, 140,401 camels, 1,231,797 sheep, 97,871 goats, and 10 mules, making a total of 2,296,903 animals, besides 66,822 that were in possession of the settled population. As compared with the figures of 1882, there has been a diminution of 355,000 horses, 60,000 cattle, 60,000 camels, and about 700,000 sheep. But as the horses and camels, above a certain number, are non-productive, their diminution is a sign of prosperity rather than the contrary.

6. Uralsk

Uralsk lies on the northeastern corner of the Caspian Sea between the forty-fifth and fifty-third parallels of north latitude, and the fiftieth and fifty-seventh meridians of longitude east of Greenwich, and has an area of 141,174 square miles, being about three and one half times as large as Ohio. It is bounded by Astrakhan on the west, Samara and Orenburg on the north, Turgai and the Sea of Aral on the east, and the Transcaspian region on the south. About one fourth of the territory is occupied by Ural Cossacks, who are principally found in the vicinity of the Ural River engaged in fishing. According to the census of 1897, they number 113,626. Of Russian peasants and Kirghiz who have adopted settled life there are 65,826; while there are 465,977 Kirghiz nomads, making a total of 645,429. The climate is marked by great extremes, being cold and dry in winter, and hot and dry in summer, the rainfall being only eight inches, but it mostly falls during the spring and early summer. The average temperature is that of Southern Russia, namely, 46.4, while its winter temperature is lower than that of Finland. Through the influence of the drought and heat all vegetation is destroyed by the end of the summer in the interior, but the rivers and shores of the Caspian are bordered with luxuriant growth of rushes.

The Ural or "Yaik" Cossacks were among the most thoroughly organized of the independent frontiersmen of Russia, and long resisted incorporation into the empire. They are largely colonists of Raskolniks from Northern Russia who came here in search of civil and religious freedom, and are

still among the best representatives of the Great Russian family, and their local communal organization is still largely respected by the government. They are principally engaged in fisheries along the Ural from Orenburg to the Caspian Sea. In 1897 the product of their fisheries amounted to \$1,600,000, 28,925 men having been employed in the business, beside 7,462 other workmen, and 6,170 boats. The fisheries are carried on by the communities as a body, and the proceeds are divided up among the villages according to their working units and their needs. Agriculture is carried on to a limited degree. They freely exchange their products with the Kirghiz. A large amount of salt is obtained from the inclosed lakes in the interior, some of which are at even a lower level than the Caspian Sea.

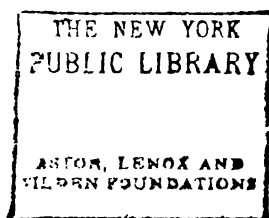
In 1560 the Ural Cossacks formed an independent community which long resisted the Russian power, and even after they were incorporated in the empire serious revolts took place under Razin and Pugatcheff in 1774; while there were smaller outbreaks as late as 1874, originating in opposition to compulsory military service. In consequence of this, 2,500, with their families, were exiled to Turkestan, where they now form an important part of the loyal population.

The Kirghiz depend almost entirely on cattle breeding for their subsistence. In 1897 they had 454,000 horses, 745,000 horned cattle, 2,400,000 sheep, 174,000 goats, and 205,000 camels, 6,527 hogs but only 905 mules. In 1879 there was a fearful epidemic of murrain in which the Kirghiz lost more than three fourths of their horses and cattle, and the Russians

two thirds of their horses and one third of their other stock. But even this has not interfered with their general prosperity, as their stock numbers now far more than previous to that calamity.



Ready for a Pilgrimage in Tashkent.



XVIII

TURKESTAN

1. Bokhara

BOKHARA, though not incorporated in the Russian Empire, is properly considered in this connection, because of its political and physical relations to it. It is surrounded by Russian territory on three sides, is directly crossed by the Transcaspian railroad, and recognizes the suzerainty of Russia, and so is reckoned as one of the Russian dependencies in Asia. It lies between latitude 37° and 41° N., and east longitude 62° and 72° , extending for a distance of six hundred miles on the east side of the Amu Daria River. It is bounded on the north by Amu Daria; on the east by Syr Daria, Samarkand, and the Pamir; on the south by Afghanistan; on the west by the Transcaspian Province and Khiva, and has an area of about 92,000 square miles with a population of 2,500,000. Of its chief towns, Bokhara has 75,000; Karshi, 25,000; Khuzar, Shehri-Sebz and Hissar 10,000 each; while Charjui, Kara Kul and Kerminch are cities of considerable importance. The inhabitants are all Mohammedans, Bokhara having been for a long time the center of Mohammedanism in Central Asia.

Bokhara depends almost entirely upon irrigation, the water being derived from the Zerafshan, which passes through Samarkand, and the Amu Daria with its tributaries in the upper portions of the valley. The country produces in abundance wheat, maize, tobacco, hemp, fruit of all kinds, cotton, and silk; the annual yield of cotton being estimated at 32,000 tons, and of silk 967 tons. Of domestic animals, camels, horses, sheep, and goats are raised in large numbers; while the textile fabrics largely made by hand, especially those from wool and silk, find markets in all the world, "Bokhara rugs" being especially noted. There is an abundance of salt to be obtained from the dried-up lakes of the desert region; while alum and sulphur are sufficiently abundant to be reckoned as important products, and gold is found more or less in the sand of all the streams coming down from the mountain.

The Transcaspian railroad crosses the Amu Daria, and enters Bokhara at Charjui, about one hundred miles from the city of Bokhara, and, following up the valley of the Zerafshan, reaches the border of Samarkand about one hundred miles the other side of the city, having a length of about two hundred miles within the bounds of the province.

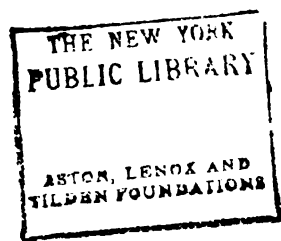
This state was founded by the Usbeks in the fifteenth century, and was one of the results of the work of Tamarlane. The present dynasty of Emirs came into power at the close of the eighteenth century. In 1866 a holy war was proclaimed against the Russians, which ended in a Russian triumph, and the cession of the lower part of their possessions, constituting what is now the district of Syr Daria, to the Russians. By



•Mohammedan Pilgrim.



A Sart Woman in Full Dress.



the provisions of the treaty following this war the Russians were given a monopoly of the foreign trade, and no foreigner was admitted to the territory without a Russian passport. Still the Emir maintains an army of his own, and administers all the internal affairs of the state.

2. Khiva

Khiva is likewise a vassal state, administering its own internal affairs, but recognizing the suzerainty of Russia. It lies between the latitude 41° and $43^{\circ} 40' N.$, and between east longitude 58° and $61^{\circ} 50'$. It is bounded on the north by the Aral Sea, on the east by Amu Daria and Bokhara, from which it is separated by the Amu Daria River, and on the south and west by the Transcaspian Province. It has a length of 200 miles, a breadth of 140, and an area of 22,320 square miles, with a population of 800,000, of whom 400,000 are nomadic Turkomans. The agricultural population is entirely dependent upon irrigation, and is thickly settled over a comparatively small area, which constitutes the "Oasis of Khiva." The political independence has been long maintained by the difficulties attending any army of invasion in its attempts to cross the surrounding desert. Its cities are small, but numerous. Khiva has about 5,000 inhabitants; New Urgend, 3,000; while among the smaller places may be mentioned Kungrad, Khodjaili, and Hazar-asf.

Like Bokhara, Khiva has long been a center of fanatical Mohammedans. Among its products, cotton and silk are prominent, the annual yield of cotton being over 8,000 tons,

and of silk more than forty-eight tons, while all small grains, fruit, and tobacco grow luxuriantly in the irrigated region, and flocks and herds abound among the nomad tribes.

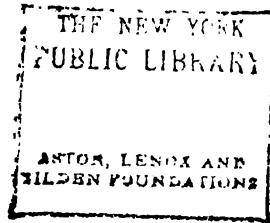
The Khanate of Khiva is likewise an Usbeg state which arose amid the ruins of Tamarlane's kingdom. The Russian supremacy was recognized early in the eighteenth century, but no practical control was obtained until 1872, when, for the ostensible purpose of protecting their Kirghiz Tartar allies, the Russians, as already related, sent in an overwhelming force from every direction, and took possession of the country, freeing a large number both of Persian and Russian slaves that were held in subjection. The Khan, however, was permitted to remain in nominal possession of his throne, maintaining a small army of his own, and administering the internal affairs of the state.

3. Ferghana

Ferghana, situated between the thirty-eighth and forty-second degrees of north latitude, and the seventieth and seventy-fourth of east longitude, is bounded upon the north by Syr Daria, on the northeast by Semirechensk, on the east by Kashgar, on the south and southwest by Afghanistan. It has an area, including the Pamir, of 86,000 square miles, and a population of 1,560,411. The most thickly settled section of the province occupies the upper portion of the valley of the Syr Daria, which is nearly surrounded by various branches of the western enlargement of the Tian-Shan range. This valley is about one hundred and sixty miles long and sixty-five miles



Madrasah on the West Side of the Bibi-Khanum, Samarkand.



wide in its broadest portion, including an area of 6,000 square miles. Coal is found all around its border. There is but one route through which it is possible to construct a carriage road, and that is along the banks of the river Syr Daria through the narrow pass of Khojent. This pass is now utilized by the railroad. This has always been the main entrance to the valley, and is the point at which the road from Bokhara enters. Eastward the exit is by the celebrated Terek Pass, which, at an elevation of 9,140 feet, leads over to Kashgar. From earliest times this has been one of the most important caravan routes between China and the west. By passes equally high or higher a direct caravan route leads over the mountains from Bokhara northward to Kuldja, and southward to the Pamir.

The province is divided into six districts: Margelan, with a population of 326,149; Andidjan, 351,187; Kokand, 365,410; Namangan, 357,023; Oshski, 158,204; and the Pamir, 2,438, making a total of 1,560,411. Of these, 853,279 are males, and 707,132 females. In these statistics, as in several other tables concerning Asiatic Russia, it is noticeable that there is a great excess of males over females, being in this case 146,147. So constantly is this the case, even in those provinces into which exiles have not been sent, that one is led to suspect some error in the census, owing perhaps to the difficulty of securing an enumeration of the females, arising very likely from the secluded habits of the women connected with the Mohammedan religion.

Of this population, 286,369 are in cities above 8,000 namely, in New Margelan, 8,977; Old Margelan, 36,592; Andidjan,

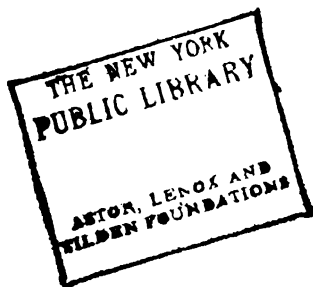
46,680; Kokand, 82,054; Namangan, 61,906; Ust-Namangan, 13,686; Ush, 36,474.

About one third of the population of the district are nomads, occupying the mountainous areas. The settled population is divided between the Tajiks and the Usbegs. The Tajiks are more or less pure representatives of the ancient Aryan races of the region. But there has been much intermingling of the Usbegs with the Turkish stock. When settled in the towns, where the intermixture has been the largest, these form the class known as Sarts. The predominant race, however, in the province, are Usbegs. There are also some representatives of the people inhabiting Kashgar who have fled to Ferghana to escape Chinese oppression. The nomads belong chiefly to the Kipchaks, who live mostly in the northern and eastern districts, and cultivate the land to a considerable extent; and to the Kara Kirghiz, or Buruts, who spend their summers chiefly in the Pamir and bordering mountains, coming down to the valley for the winter.

Ferghana has had a long and eventful history. Its fertile plains have always been so attractive that the surrounding mountains could not furnish them adequate protection. In 719 A. D. the province was overrun by the Arabs, and during the ninth and tenth centuries was ruled by the Samanid dynasty, which sprang up in the eastern portion of Persia, while in the twelfth century it was in subjection to the celebrated Kara-Kitái the forerunner of Jenghiz Khan, who had established his capital at Kuldja. In the following century Ferghana formed a part of the empire of Jenghiz Khan, who in due time was suc-



Ruins of the Bibi-Khanum at Samarkand.



ceeded by Timur the Tartar, with his capital at Samarkand. But in 1513 the Usbegs expelled Timur's descendant Baber, after which, until the middle of the eighteenth century, the province was divided up into separate cities and clans, each with its own Bek or ruler.

It was not until about 1770 that these clans were reunited under one ruler. From that time until the middle of the nineteenth century the khans of Kokand extended their conquest on every side, especially on the north and northwest, where their influence was predominant in Semirechensk, where they were met and expelled by the Russians in 1853. Their last ruler Khudahyr Khan, however, kept for a long time on good terms with the Russians, but was greatly hated by his own people, and was more than once expelled by them; so that in 1874 they were glad enough to exchange his rule for that of the Russians, who, however, did not become firmly established until, with great destruction of life and property, they had crushed a religious war which was excited against them almost immediately upon their entrance. Since then the Russians have maintained their administrative center at Margelan. The laws, however, have been changed as little as possible, justice being administered in civil cases according to the Mohammedan code, but in criminal cases by the Russian code. The nomads also retain their own elders and largely their own organization in the management of their internal affairs.

According to the census of 1897, there were 2,563,377 acres under cultivation. There were harvested 1,532,524.8 cwt. of rice, 2,994,186 cwt. of jugara (*Sorghum cernuum*, a large

variety of millet growing to a height of ten or twelve feet), 2,764,083.2 cwt. of winter wheat, 1,104,000.8 cwt. of spring wheat, 350,950.8 cwt. of barley, 466,976.4 cwt. of small millet, 1,576,722.8 cwt. of other spring grain, 40,956 cwt. of potatoes. In 1896, 347,534 acres were planted to cotton, which yielded 2,643,600 cwt.; 172,800 acres of vineyards yielding 552,800 cwt. of grapes; while 20,880 cwt. of silk were collected. There were 24,760 camels, 316,111 horses, 277,240 cows, 1,243,479 sheep, 348,404 goats, 164,913 oxen. At the same time the manufactured products were valued at 12,820,999 rubles. The most important of them were silk, amounting to 173,240 rubles; leather, 241,035; flour, 182,624; oil, 420,389; brick, 103,280; cloth, 119,970; cotton, 11,076,036.

4. Samarkand

Samarkand, bounded by Syr Daria on the north, Ferghana on the east, and Bokhara on the south and west, has an area of 26,627 square miles, with a population of 857,817, of whom 472,915 are males, and 384,932 females.

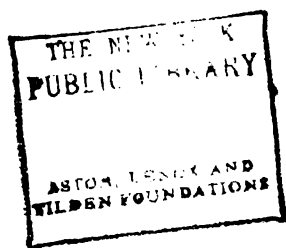
Being mostly situated about the loess-covered base of the southwestern spur of the Tian-Shan range, and watered by the Zerafshan River and other smaller mountain streams, it is a region of great fertility. In 1897 the agricultural products amounted to winter wheat 4,909,968 bushels; spring wheat, 3,730,938; rice, 2,175,322; barley, 2,576,760; and other bread-stuffs, 1,295,454; while there were raised 195,936.4 cwt. of American cotton, and 87,508 cwt. of native, making a total of 283,444.4 cwt., which was an increase of 41,600 cwt. on the

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Village in the Caucasus Mountains.



preceding year. Its vineyards yielded 938,840 cwt. of grapes, and its orchards 508,400 cwt. of fruit, making a total of 1,447,240 cwt. At the same time there were in the province 82,758 horses, 170,884 horned cattle, 1,051,073 sheep, and 45,823 camels; while the trade of the province amounted to 25,382,350 rubles.

Samarkand, the capital city, has a population of 56,000, of whom 16,000 are Russians, and is in every respect the most interesting city of Turkestan. Surrounded on three sides by snow-covered mountains, but itself in a verdure-clad valley of great productiveness, it has from ancient times been called the "Eye of the World." About the close of the fourteenth and the beginning of the fifteenth century, Timur the Tartar, more commonly known as Tamerlane, established his capital here, and from it well-nigh ruled the world, extending his dominion from Russia to the Persian Gulf, and from Constantinople to the Ganges. Timur likewise made Samarkand a great center of learning, and he and his successors adorned it with buildings whose proportions and beauty challenge, even in their ruins, the admiration of the world. Four hundred years of neglect and a recent earthquake have well-nigh destroyed two or three of these splendid edifices, but even now they rear their domes and arches and campaniles high above the mud dwellings of the present wretched city, and look down upon the Babel of an Eastern market place, where everything is sold, from cotton, wool, and silk, to perishable fruit, old clothes, and scrap-iron.

The best preserved of them is known as the Rigistan. This

is a square of two hundred and fifty feet, open to the street on the south side, but enclosed on the other three sides by lofty, well-proportioned buildings, brilliant in harmonious colors of enameled brick. Beautiful shaped campaniles adorn the corners, and noble archways lead into interior courts surrounded by cloisters for Mohammedan mollahs. During the Middle Ages the tenants of these cloisters carried the study of mathematics and astronomy to a high degree of perfection, and made their city renowned for learning as well as for war. But now the tenants are a miserable set, only waiting for another earthquake to put an end to their whole business.

A few hundred yards to the northeast of the Rigistan are the still more extensive ruins of the Bibi Khanum, the archway and towers of whose façade were pronounced by Vámbéry a model for such buildings. This, too, was richly colored with enameled brick. At one time it is said to have sheltered as many as a thousand students, but the recent earthquake has nearly completed its ruin. One of the domes and two of its lofty arches still stand, though ready to fall.

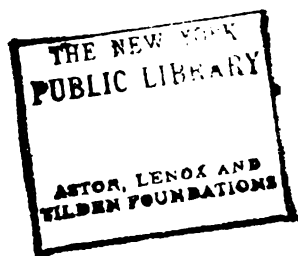
Still farther east are the graves of Timur's wives and sisters. These consist of a series of domes, with interior decorations of marvelous beauty, crowning successive terraces reached by forty marble steps. They are still in a fair state of preservation, and though birds find a welcome home on all the cornices, and the dust-laden winds have free course everywhere, they continue to stand as noble monuments, all the more conspicuous by reason of the repellent character of everything else in the

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The Tombs of the Wives of Tamerlane at Samarkand.



neglected Mohammedan cemetery to which they form an entrance.

A quarter of a mile to the southwest of the Rigistan is the grave of Timur himself. Here, too, the recent earthquake has wrought the ruin of a portion of the noble pile, but has left uninjured the chapel and lofty dome above the grave itself. This is covered with a large piece of rare jade, and the chapel and whole interior of the dome are adorned with elegant arabesques and inscriptions of gold. Everything about it, both outside and in, is most impressive and appropriate. Indeed, in its time, the splendor of this city was unexcelled anywhere in the world. And it was not barbaric splendor, but that of the highest art of the Saracens. Those who would view it, however, even in ruins, must make haste, for time has already nearly completed its destructive work.

5. Syr Daria

Syr Daria is situated upon both sides of the river of that name, extending from the Aral Sea to the Tian-Shan range above Khojent. It is bounded on the north by Turgai and Akmolinsk, on the east by Semirechensk and Ferghana, on the south by Samarkand, Bokhara, and Amu Daria, and on the west by the Aral Sea. It has an area of 194,853 square miles, and a population of 1,479,848, of whom 804,134 are males, 675,714 females. Of the cities, Tashkent has 156,414; Aulicata, 12,006; Kazalinsk, 7,600; Perovsk, 5,196; Chimkent, 10,756; Turkestan, 11,592; Petro-Alexandrovsk, 2,758.

The southeast corner contains the complex of mountains projecting from the Tian-Shan range known under various names as the Chatkal, Urtak-tau, and Aksi with the long range of the Kara Tau projecting two hundred and seventy miles to the northwest. Manas Peak, south of Aulieata and the valley of the Talas, rises to the height of nearly 15,000 feet, and supports a glacier of considerable size, which furnishes perennial water to tributaries of the Talas, on the north, and of the Chatkal on the south. The bordering mountains gradually diminish in height toward the plain, and furnish excellent pasture ground for the Kirghiz Tartars. The range consists essentially of three or four parallel axes of granite running from southwest to northeast containing in their intervening troughs Carboniferous and Tertiary strata; while the Kara Tau range consists almost entirely of these sedimentary rocks, and its axis of elevation is nearly at right angles to that of the others mentioned, and is supposed to belong to a later series of upheavals. Its average height is about 5,000 feet, with some peaks rising to 7,000 feet. The Nura Tau range, which on the south separates Syr Daria from Samarkand, also runs in a northwest-southeast direction, and, rising abruptly from the steppes, seems to be connected with a series of isolated elevations some of them with granitic cores extending northwest nearly to the Aral Sea.

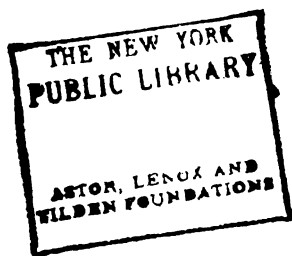
The mountainous region, however, occupies but a small portion of the province, by far the larger area consisting of desert plains, the principal portion of which is known as the Kizyl-kum, or "Red Sand," so called from its color. As described



A Drygoods Stall in the Bazaar at Tashkent.



A Kirghiz Bride.



by Mushketoff, this desert, stretching from the Aral Sea, where it has an elevation of 160 feet above the ocean, extends south-eastward to the mountain border, where it has an elevation of 2,000 feet. Near the Aral Sea it is covered with dunes from thirty to sixty feet in height, and arranged, for the most part, in parallel lines. In the intervening spaces are areas of considerable extent which are covered with clay. In the spring, for a short time, this region is clothed with a rich verdure, furnishing pastures for the flocks of the Kirghiz. But in the summer the great heat, the absence of water, and the strong winds with their clouds of hot sand, render the country almost impassable, the annual rainfall being less than four inches. Farther to the east the dunes are less shifting, and are covered with a species of sedge which furnishes food for sheep; while the higher ridges support numerous shrubs and gnarly trees of diminutive size which serve for fuel, and from which charcoal is made and exported to Bokhara. All the western portion of this desert is covered with late sedimentary deposits from the sea which, until recent times, occupied the Aral-Caspian basin.

The Kara Kum (Black Sand) lies upon the northeast of the Aral Sea. It also is covered with deposits of the recently dried-up waters of the Aral-Caspian Sea, containing large numbers of shells of various species of marine animals. The eastern portion alone supports vegetation of any account, and is visited by the Kirghiz Tartars.

The Ak Kum desert, lying between the river Chu and the Kara Tau range is totally uninhabited. All around the base

of the mountains, however, but lying mostly more than 1,000 feet above sea-level, there is a broad belt of loess, which is exceedingly fertile, and readily watered by irrigating streams which come down from the heights, while extensive coal beds are found in the Jurassic strata which occupy the basin of the Badan, Siram, and Ferghana rivers.

The climate of the province varies greatly in its different parts. In the lowlands of the western portion the annual rainfall is less than four inches; the summers are extremely hot, the thermometer often running up to 108° F., the average temperature in July being +82.4°, while the winters are cold, the thermometer going as low as -13°, the average for January being -24°. In the mountainous districts of the east there is more variety, and the extreme cold of winter in the highest levels is unendurable. The Syr Daria in its lower portions remains frozen for 120 days.

The productive belt of loess bordering the mountain base and irrigated by mountain streams is only about one per cent of the total area; while only forty-two per cent of the plains is reckoned as pasture land, leaving fifty-seven per cent as desert, totally unavailable either for crops or pasture. But the loess belt is exceedingly fertile, as appears from the statistics, the annual harvest of rice being 2,999,924 cwt.; Indian corn, 647,780 cwt.; winter wheat, 1,909,512 cwt.; spring wheat, 3,382,844 cwt.; barley, 187,790.4 cwt.; millet, 875,756 cwt.; small millet, 208,606 cwt.; other bread stuffs, 126,972 cwt.; potatoes, 28,404 cwt.

Of livestock the province has 466,300 horses: 432,100 horned



Street in Tashkent under Irrigating Ditch.



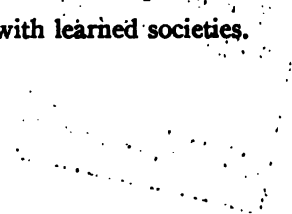
Bazaar in Tashkent.



cattle; 4,265,600 sheep; 501,200 camels; 755,360 goats; 17,070 mules, but only 3,830 hogs.

Cotton is also cultivated to a large extent, 495,200 cwt. being gathered in 1897. Of this 310,000 cwt. was from American seed. Silk, also, is produced to the amount of two or three thousand cwt. annually. 4,314.8 cwt. of grapes were raised and 3,948.8 cwt. of tobacco, while the total annual product of the manufactured articles is valued at 3,388,000 rubles, of which cotton amounted to 1,234,005 rubles.

The educational interests are represented by 2,533 schools attended by 26,812 boys, and 6,246 girls; in all, 33,058. The city of Tashkent has also an important museum and library, and is well supplied with learned societies.



XIX

WESTERN SIBERIA

I. Tobolsk

TOBOLSK occupies the central and northern portions of the vast basin of the Obi, extending from the fifty-fifth to the seventy-third parallel of north latitude, and reaching from the eightieth meridian of east longitude in its northern portion to the one hundredth in its southern. It is bounded on the north by the Arctic Ocean, on the east by Tomsk and Yeniseisk, on the south by Akmolinsk and Semipalatinsk, on the west by Archangel, Vologda, Perm, and Orenburg. The Ural Mountains form its western border from the Kara Sea down to near the fifty-eighth degree of north latitude, where they reach their greatest height in peaks of nearly 6,000 feet. Farther south than this the Urals are in the provinces of Perm and Orenburg.

Tobolsk has an area of 439,659 square miles, with a population in 1898 of 1,474,804. Of the total population, about 40,000 are Tartars, 20,000 Ostiaks, 7,000 Samoyedes, and 6,000 Voguls, making about 75,000, the rest being pure Russian; so that the province is more characteristically Russian than are those upon the Volga in the European portion of the empire. Of

the Russian population, 30,000 or 40,000 are exiles living at large, but under police surveillance, and belonging generally to the poorest classes; while the Raskolniks, or Nonconformists, who came to the country to secure greater religious freedom, form an unusually large portion of the most prosperous members of the population. They are estimated to number from 75,000 to 100,000.

In towns there were in Tiumen, 29,620; Tobolsk, 20,058; Kurgan, 10,384; Tara, 7,267; Ishim, 7,137; Tiukalinsk, 4,041; Yelutorovsk, 3,293; Turinsk, 3,133; Surgut, 1,128; and Berezof 1,087.

The recorded births for the year throughout the province were 74,508, and of deaths 51,087.

The northern part of the province lies upon both sides of the Gulf of Obi, which extends 550 miles south from the Kara Sea. The Yalmal Peninsula extends nearly the entire distance between the Gulf of Obi on the east and the Kara Sea upon the west. The whole of this area, as well as the remaining portion as far south as the sixtieth degree of latitude, is tundra, occupied, so far as it is inhabited at all, except along the Obi River, by Samoyedes, Ostiaks, and Voguls. The Gulf of Obi is so clogged with ice the year round that its navigation has never been practicable; but, very early in the settlement of Siberia, traders and adventurers established settlements at Berezof and Obdorsk, the latter being near the mouth of the river on the Arctic Circle.

The central portion of this vast plain, from about the fifty-eighth to the sixty-first degree of north latitude, occupying the

whole intervening space between the Irtysh and Obi rivers and extending considerably beyond them on either side, is a vast impenetrable morass covered with quaking bogs and marshes interspersed with islands of low elevation on which habitation would be possible if there were only any means of access. In winter the country can be traversed on the frozen soil, but in the summer it is practically impassable, except by the use of snowshoes, which serve the same purpose on the quivering marshes that they do elsewhere in the proper season of the year on the snow. At the same time the whole area is largely covered with immense cedar trees, while larches, firs, pines, birches, and maples are everywhere found, and the underbrush is so thick that it cannot be penetrated, except as one slowly cuts his way before him. The marshes go by the name of *urmans*, and many of them have never been penetrated by man. Those which are accessible have, however, furnished favorite refuges for nonconformist colonies, who have from time to time fled from Russia to escape persecution.

The southern portion of Tobolsk, however, possesses some of the finest agricultural areas of the world, including the prairies or steppes about the Tobol and Ishim rivers in the west, and that of the Baraba in the east. About one third of the western steppe is covered by forests, mostly along the streams, while the remainder has all the characteristics of the black earth belt of European Russia, and is exceedingly fertile, being indeed counted the granary of this portion of Siberia and Northeastern Russia. The eastern portion, known as the Baraba Steppe, is, on the other hand, perfectly flat, has few

rivers, and abounds in lakelets and marshes which have no outlets, and all of which are reported to be rapidly drying up. In some cases flourishing villages now occupy areas that formerly were covered by water. The largest of these lakes, Lake Chany, has an area of 1,265 square miles.

The forests are chiefly birch, scattered in separate clusters over the region. The drainage is so poor that only a small portion of the land is at present capable of cultivation; but what there is, is very productive. Naturally from the prevalence of the marshy lands, the whole region is a regular breeding-place for mosquitoes, which float over the country in such dense clouds in the summer that they render life miserable, and (since the great Russian road passes through it), have served to give a bad name to the whole country.

Except in the Ural Mountains no hard rock appears anywhere in the province, the whole area being enveloped in Post-Pliocene deposits, which extend to the very summit of the water-parting between the valley of the Obi and the Aral-Caspian basin.

The climate of Tobolsk is in all parts extreme, ranging from 95° above zero in summer, to 49° below in winter. In the latitude of the southern portion the rivers freeze on November 12, and remain closed until May 1; while at Obdorsk the river is ice-bound from October 23 to May 31.

The river system affords an intricate and extensive water communication, the Obi being navigable for 1,300 miles in the province, while the Irtysh and its numerous branches bring it into close connection with European Russia. The Irtysh is

itself navigable within the province for a distance of 760 miles, the Tobol for nearly 400 miles, and the Tara for an equal distance. These rivers are open for navigation in the south for nearly six months. One hundred and fourteen steamers of 5,000 tonnage are plying upon these waters, the first steamer having been launched in 1845, and the second in 1860.

The yield of breadstuffs in Tobolsk in 1897 was winter rye, 2,360,781 cwt.; winter wheat, 14,750 cwt.; spring rye, 1,360,904 cwt.; spring wheat, 8,858,694 cwt.; oats, 8,640,994 cwt.; barley, 1,163,606 cwt.; buckwheat, 157,418 cwt.; peas, 173,950 cwt.

Of livestock there were altogether 3,047,076 head, of which the horses numbered 736,233; cows, 985,522; sheep, 1,068,218; hogs, 226,516; goats, 29,595.

The manufactured products were valued at 6,286,552 rubles, and the traffic of the year amounted to purchases of 14,147,942 rubles, and sales of 8,252,582.

The educational work is represented by 701 classical schools of which twenty-three were in Tobolsk, fifty in the provincial cities, and 628 in the villages, with a total attendance of 23,354.

2. Tomsk

The province of Tomsk lies between the forty-ninth and sixty-first parallels of north latitude, and ninety-third and one hundred and eighth meridians of east longitude. It is bounded on the north by Tobolsk, on the east by Yeniseisk, on the south by the Chinese province of Kobdo, and on the west by Semipalatinsk, and Tobolsk, and has an area of 331,159 square miles, with a population of 1,929,092, giving an average of six

to the square mile, which is considerably in excess of any other Siberian province. Of this total, 970,780 are males, and 958,312 females. Of the towns, each of which is the capital of a district. Tomsk has 63,861; Barnaul, 29,408; Biisk, 17,713; Kainsk, 5,534; Kusnetsk, 3,124; Mariinsk, 8,742.

The southern end of the province includes a portion of the Altai Mountains, 53,000 square miles of which are within the Russian dominions—an area three times as large as that of Switzerland, abounding in scenery of equal interest. These mountains furnish the headwaters of the Obi River, and have in the principal summit, Mount Bieluka, and several others, peaks upwards of 11,000 feet in height. A large number more are above 8,000 feet in height; while numerous small glaciers still remain in the highest portions. The mountain slopes are covered with forests. The river valleys are beautiful and fertile. Of the rivers the best known is Bukhtarma, which flows for 180 miles across the southwestern portion of the range, emptying into the Irtysh some distance above Semipalatinsk. The headwaters of this stream interlock with those of the Katun, which flows into the Obi at Biisk, and with those of the Kobdo, which flows southward into Mongolia. The pass where these three streams unite to the south of Bieluka, though 9,280 feet high, is one of the few which furnish communication between Siberia and Mongolia east of Lake Baikal. Several small lakes are found in the higher elevations, where Alpine flora and fauna maintain themselves in isolated positions, being surrounded by dwarf birch, and frequented by the polar marmot. Lake Teletskoi, forming an enlargement

in the Biya River. though only 1,200 or 1,500 feet above the sea, is so surrounded with lofty mountains as to remind one of Lake Geneva. In general the flora of the Altai is very rich, since that of the steppes and the mountains here unite. It is evident, however, that conditions are changing, since the beech and some other European trees which at a recent period abounded, have now entirely disappeared, while the flora of the steppes is advancing to a higher level upon the mountain slopes. Here, also, the reindeer from the north, and the bactrian camel and the tiger from the south are found in close proximity.

The Altai Mountains are bordered by elevated grassy plains about two hundred miles wide, extending from the vicinity of Semipalatinsk to Tomsk. These have an average elevation of about 1,000 feet, and furnish some of the most excellent farming land in the world. The southwestern portion is known as the Kulundinskaia Steppe. That the whole region has been recently elevated above the sea is evident from the loamy sediment with which it is covered, and by the imperfection of its drainage system, there being numbers of parallel lines of long, narrow lakes running towards the Obi which seem to represent river valleys which have not been in existence long enough for the streams to have cut down their channels sufficiently to secure perfect drainage.

To the north of this higher belt of prairie land there lies the Baraba Steppe, which is the eastern extension of that described in Tobolsk, and which stretches nearly the entire distance from the Irtysh to the Obi River, while farther north

still lies the boundless and impenetrable marshy district which covers so much of Tobolsk between the lower parts of these two streams.

The geology of the district is complicated and interesting. The Sailughen Mountains, which form the southeastern boundary between Tomsk and Kobdo, consist of granitic rocks partly covered by remnants of the older sedimentary strata corresponding in age to the Huronian of Canada. The Altai Mountains also have a core of granitic rocks partly covered in a similar manner with sedimentary Huronian strata and with layers of crystalline limestone, and breccias which are the product of later volcanic eruption. Silurian and Devonian slates and limestones abound in the southern portion of the mountains, furnishing the valuable metalliferous deposits for which the country is celebrated. Carboniferous limestones and slates are more extensively found both in the north and the south, while Jurassic deposits, intersected by dykes of basalt, occur in the Salair Mountains. All the northern part of the province, however, as already said, is enveloped with thick Post-Pliocene sediments like those which cover Southern Russia and those of the prairie region of the Mississippi Valley.

The province is watered by the Obi and its branches. These branches are navigable throughout almost their entire length; a line of steamers from Tiumen and Tobolsk forming an easy communication with Tomsk, which is on the main east-and-west line of the old military road, and but a short distance from the points on both the Obi and the Tom River where the railroad now crosses them. The main channel of the Obi is navigable

several hundred miles above the intersection of the railroad to Biisk, passing through Barnaul on the way; while the Tom is navigable to Kusnetsk; and the Chulym for a still greater distance to Povoselovskoe, near which it approaches to within a few miles of the Yenisei River, between Krasnoyarsk and Minusinsk. It is in the province of Tomsk, also, that the Ket River reaches the Obi, and furnishes the navigable approach to the short canal already spoken of leading to the headwaters of the Kas, through which boats pass into the Yenisei.

The climate of Tomsk, like that of all the other provinces, is severe, but by no means as severe as in some. The average rainfall in the southern part is 15.71 inches, and in the northern part 10.92 inches. The average yearly temperature at Tomsk is 32° F., with extremes ranging from 95° to —67°. The rivers remain frozen from November 12 to May 1. Grain ripens upon the flanks of the Altai Mountains up to a height of 4,000 feet.

In 1897 there were harvested 9,763,734 bushels of winter wheat, 18,912,114 spring wheat, 7,496,652 rye, 23,331,510 oats, 3,188,388 barley, 505,146 buckwheat; other grains 2,907,108; and of potatoes, 5,962,050.

Of livestock there were 1,776,024 horses, 1,791,086 horned cattle, 83,697 fine wool sheep, 2,291,842 coarse wool sheep, 148,674 goats, 427,941 swine, 495 camels, 1,338 buffaloes, but only three mules, two of which honor Kainsk with their presence, and one Tomsk. The buffaloes and camels are all in Biisk. Bee-keeping, also, assumes unusual proportions, there

being in Barnaul no less than 180,000 colonies or swarms; in Kusnetsk, 90,000.

The products of their shops, mills, and factories were valued at 5,071,824 rubles, which were turned out by 855 establishments, employing 3,609 laborers.

From the mines the annual yield of gold has been as high as \$1,800,000; while that of silver has been 435,440 ounces, and of copper, 7,051 cwt., and of salt 360,652 cwt.

The trade of the province is mainly carried on through sixty-four Fairs, lasting from one to two weeks each, in as many different cities and villages. At these the sales are estimated at between 6,000,000 and 7,000,000 rubles.

The educational interests are led by the University of Tomsk, which had in 1897 an attendance of 383, but has been much increased since. The total number of schools of lower grade was 1,571, with an attendance of 34,333 boys, and 10,952 girls; 45,285 in all.

XX

EASTERN SIBERIA

1. Irkutsk

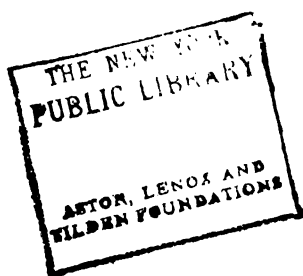
IRKUTSK lies between the fifty-first and sixty-second degrees of north latitude, and is bounded on the north by Yakutsk, on the east by Transbaikalia, from which it is separated by Lake Baikal, on the south by Mongolia, and on the west by Yeniseisk. It has an area of 287,061 square miles, with a population of 506,517, of whom 267,520 are males, and 238,997 females. The population of the towns, each of which is a capital of a district, is: Irkutsk, 51,484; Balagansk, 1,283; Verkholsensk, 1,275; Kirensk, 2,798; Nijni Udinsk, 5,696. Of the total population 100,000 belong to the native tribes, mostly Buriats.

The southwestern portion of the province, bordering the East Sayan range, is mountainous and similar in character to the southeastern portion of Yeniseisk, which adjoins it. The Sayan Mountains reach to an elevation of from 6,000 to 8,000 feet, the highest peak, Mungu Sarduiik, being across the Mongolian border. Other mountain masses of vast extent in the southern portion are the Tunkinsk Byelki, the Chinese Goltzu and the Khara Murin, all near the Mongolian border, the last

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Irkutsk.



forming the southern boundary of Lake Baikal. These mountain masses are intersected by broad, deep, but fertile channels of erosion, occupied by the Irkut, the Kytok, and the Urik rivers. Besides these mountains there is a continuous chain on the west side of Lake Baikal which nowhere much exceeds 3,000 feet, but forms the watershed between the lake and the upper portion of the Lena River.

Geologically the mountains consist chiefly of crystalline rocks which contain in the western portion extensive deposits of gold-bearing gravels; while iron is found in considerable quantities in many portions, and graphite in some. There is also a wide distribution of eruptive rocks in the province, including basalt, obsidian, and pumice. The central portions of the province are covered with sedimentary deposits of a later age, mostly of Jurassic and Tertiary strata; the Jurassic containing wide-spread and extensive deposits of lignite, which may eventually prove to be of great value. The central and lower part of the Angara River, however, passes through broad areas of Silurian and Devonian rock.

The climate of the province of Irkutsk is extreme, though it is modified to some extent by its proximity to the great body of water in Lake Baikal, but the thermometer ranges from 104° in July to -58° in January, with an average in those months of 68° in July and -4° in January. The average rainfall is eleven inches, mainly falling in the month of August.

The city of Irkutsk is the residence of the Governor-General. It is 3,780 miles from St. Petersburg, and 1,640 from Vladi-

vostok over the direct line of the Chinese Eastern Railroad through Manchuria. As all the traffic between the east and the west, and that from the Lena Valley must pass through the city, it is naturally a place of great commercial importance. It is picturesquely situated at the junction of the Irkut River with the Angara, about forty miles below Lake Baikal. It contains a cathedral, twenty-three Orthodox churches, a well-equipped gymnasium, a school of medicine, the large museum already referred to, a splendid opera house, an orphan asylum, an infirmary, and town and military hospitals, and has long been a center of much social life and intellectual activity.

The agricultural interests of the province, however, are comparatively unimportant, though, by the last attainable statistics, 844,714 acres were sown to cereals, which, at an average of fifteen bushels to the acre, would yield 12,670,710 bushels.

Of livestock there were 264,856 horses, 335,549 horned cattle, 365,379 sheep, 85,862 swine, 48,045 goats, 773 deer.

The manufactured products were in 1896 valued in all at 2,810,439 rubles, coming from 135 establishments. Of this sum, the distilleries produced 633,792 rubles' worth, the tanneries, 399,450, the breweries 77,777, the flour mills 281,782, the salt works 133,093, the iron foundries 306,022, porcelain works 138,452, glass works, 81,188, phosphorus matches, 16,844, mechanical machinery, 52,059, typo-lithographical and book-binding works 52,553, furriers 64,100, confectioneries and bakeries 89,568, cloth factories 51,844, paper mills 35,000, and carriage makers 20,000.

Public education in the province is represented by 412 clas-

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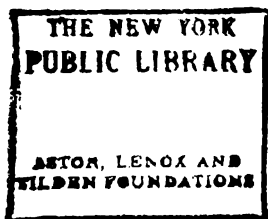


Opera House at Irkutsk.

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Museum at Irkutsk.



sical schools, with 13,755 pupils, of whom 9,421 are boys, and 4,334 girls. Of the grammar schools 162 are public, 108 church schools.

2. Transbaikalia

Transbaikalia lies between the forty-ninth and fifty-seventh parallels of north latitude, and one hundred and fifth and one hundred and twenty-fourth meridians east longitude. It is bounded on the north by Yakutsk, on the east by Amur, on the south by Mongolia, and the west by Irkutsk, and has an area of 236,868 square miles, with a population of 664,071, of whom 338,722 are males, 325,349 females. Of the population about 150,000 are Buriats, besides a few thousand Tunguses. The rest are Russians, many of whom are descended from colonists who settled in the country in the seventeenth century. To some extent these early colonists intermarried with the natives but, for the most part, they have preserved their purity of blood and national characteristics to a remarkable degree. This is especially the case with the large number of Nonconformists, who here found the desired freedom for the development of their religious and family institutions. The Russians on the Chinese border form a separate Cossack organization. According to Kropotkin,

"The valleys of the Uda, the Lower Selenga, and especially the Chikoi and the Khilok have been occupied since the beginning of the [19th] century by Raskolniks, who have received the name of Semeiskiye on account of their large (compound) families, and there one finds, in a condition of prosperity such as is unknown in Russia proper, some of the finest representatives of the Russian race."

The central part of the province is occupied by the Vitim Plateau, which consists mainly of Archæan rocks rising to a general elevation of about 5,000 feet, but descending towards the east to the Daurian Plateau, at a level of about 2,500 feet, which is that of the region of the upper tributaries of the Amur River. There are large areas of granite both on the western side of the Vitim Plateau and in the eastern portion of the Daurian Plateau. The streams running from the Vitim Plateau into Lake Baikal all occupy deep valleys of erosion, and furnish a gradual ascent for roads, together with a large amount of arable land. Iron has been found and long worked at Petrovsk, on a branch of the Khilok River, through which the Siberian Railroad passes, about one hundred miles south-east of Verkhni Udinsk. The eastern part of the province, in the vicinity of Nerchinsk, has long been famous for its silver mines; while in later times gold has been extensively obtained from placer mines in the basins of the Shilka, Upper Vitim, and in the river valleys leading into the Selenga.

It should be noted, also, that nearly all of these valleys on the western slope of the Vitim Plateau have been partially filled with Tertiary sediment, and are all of them lined with broad Post-Tertiary alluvial deposits; while in the Daurian Plateau there is a great extension of Post-Tertiary alluvium along the middle course of the Onon River and about Lake Taremskia, which occupies a large basin which is rapidly drying up. Formerly this lake emptied into the Onon, but it now has no outlet, but is a mere remnant of the large expanse of water

which filled the basin. The precipitation was larger than now.

In 1897 the agricultural products were, of rye and spring wheat, 5,961,834 bushels; millet, 1,320,698; oats, 1,865,016; barley, 546,990; buckwheat, 694,680; potatoes, 1,138,932; amounting in all to 11,528,150 bushels.

The total number of domestic animals of all kinds was, in 1898, 3,022,521. The products of factories and mills were valued at 6,029,997 rubles. The mines yielded annually \$3,000,000 worth of gold, and 35,000 ounces of silver. The total amount of imports was 3,685,718 rubles; exports 2,037,871, of which 2,912,560 of the imports and 1,645,116 of the exports passed through Verkhni Udinsk, 1,411,457 coming from China and Mongolia, by way of Kiakhta.

Educational interests are represented by four middle schools with 818 pupils, 417 of whom were girls; fifteen schools of third grade (of which eleven were for boys), with an attendance of 1,386; 290 of primary grade, with an attendance of 10,639.

3. Yakutsk

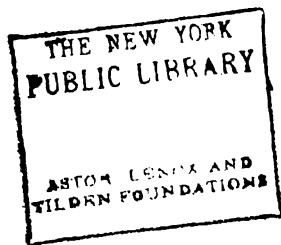
Yakutsk is included between the fifty-fourth and seventy-third degrees of north latitude, and the one hundred and fifth and one hundred and ninetieth degrees of east longitude. It is bounded on the north by the Arctic Ocean, on the east by the Maritime Provinces, on the south by Transbaikalia and Amur, and on the west by Irkutsk and Yeniseisk, and has

an area of 1,533,397 square miles, which is nearly one third of Siberia, and almost one fifth of the entire Russian Empire. Its population, however, is but 261,731 (males 136,061, females, 125,670), or about one to every five square miles. Its towns are all small, Yakutsk having 6,382, Verkhoyansk 353, Bilinsk 627, Kolimsk 500, Olekminsk 1,157. The population consists mostly of Yakuts and Yukagirs in the central and northern portions, and of Tunguses in the south. Many of the early Russian settlers, also, intermarried with the natives; so that there are many half-breeds in the Russian settlements; while a considerable number of the Skoptsy have been banished to the province, where their communities are models of thrift and cleanliness.

The southern part of Yakutsk extends to the sources of the Olekma and Aldan rivers on the summit of the Yablonoi range, and is separated from Transbaikalia and Irkutsk by the Vitim River, occupying the northern portion of the Vitim plateau, where are to be found the richest gold mines in Siberia. Aside from the mining population, this region is inhabited by only a few Tungus hunters, who wander about over the vast swampy stretches of country which characterize the high plateau. Much of the country is yet unexplored. It is, however, known to be covered with dense forests. The prevailing rocks are granites and gneisses, bordered by Huronian and Laurentian crystalline slates, which in turn are covered by extensive deposits of Silurian and Devonian sandstone; while farther to the north Carboniferous, Cretaceous, and Jurassic formations are extensively exposed, coal being found near the mouth of the Viliui and on the Lower Lena.



Yakut Family.



The northern portion is practically a vast plateau gradually descending from an elevation of about 2,000 feet to the sea-level, but it is intersected by innumerable gorges worn by the rivers and by various low mountain tracts, which, with the dense forests and severe climatic conditions, render it almost inaccessible, except along the line of the few navigable streams. East of the lower part of the Lena River, however, the Verkhoyanskii Mountains in a semicircular course opening to the northeast separate the Lena from the valley of the Yana; while lower ranges, principally in a north-and-south direction, separate the valley of the Yana from that of the Indigirka and others in succession, the valley of the Indigirka from the Kolyma, and the Kolyma from the Omolon. The entire eastern border is formed by the Yablonoi and Stanovoi Mountains, which everywhere approach within a short distance of the Sea of Okhotsk, and form an effectual barrier to free communication with its scanty harbors.

The climate has the pre-eminence of being the severest of the world, Verkhoyansk being the coldest place, and Yakutsk the place where the range of temperature is the greatest. At Verkhoyansk the thermometer ranges from 90° below zero to 93° above; while in Yakutsk the range is from 84° below to 102° above, making a total range of 186 degrees. The mean January temperature at Yakutsk is —46, and the mean July +66. The river freezes at Yakutsk October 20, and remains closed for 215 days; while the Yana at Ust Jansk is frozen 260 days. The soil of the region is frozen to a depth of 600 feet, having at the depth of 382 feet a temperature of 26 4-10° F.

The precipitation at Yakutsk is only 7 9-10 inches; while the number of cloudy days in the year is 110.

Notwithstanding the severity of the climate, the growth of vegetation is so rapid in the short summer that various crops are successfully cultivated. According to the report for 1896, there were raised in that year 612,888 bushels of breadstuffs, 594,048 bushels of potatoes; and there were cut 3,127,431 tons of hay.

Of livestock there were 113,323 horses, 288,355 horned cattle, 267 sheep, 55 hogs, 14,015 reindeer, 2,582 sledge dogs.

The fisheries yielded 4,000 cwt. of salt fish.

The products of hunting were, of skins of the common fox, 3,019; sable, 153; Arctic fox, 4,021; bear, 186; elk, 479; wolf, 41; deer and goats, 7,702; squirrels, 118,547; ermine, 10,237; hare, 36,900; the total value of which was 71,638 rubles.

The annual yield of the gold mines is \$7,000,000.

There are 67 schools, with 1,507 pupils (1,191 males, 316 females).

4. Yeniseisk

Yeniseisk lies between the fifty-second and seventy-seventh degrees of north latitude, occupying nearly the entire basin of the Yenisei River. It is bounded on the north by the Arctic Ocean, on the east by Yakutsk and Irkutsk, on the south by Mongolia, and on the west by Tobolsk and Tomsk, and has an area of 987,186 square miles, with a population of 559,902, of whom 291,555 are males, and 268,347 females. Of its cities, each of which is capital of a district of the same name, Kras-

noyarsk has 26,600 inhabitants; Yeniseisk, 11,539; Kansk, 7,504; Achinsk, 6,714; Minusinsk, 10,255, and Turukhansk, 200.

Extending, as the province does, from the West Sayan Mountains, on the borders of Mongolia (which rise to a pretty uniform height of 7,000 to 8,000 feet), to the Arctic Ocean, fourteen degrees beyond the polar circle, it presents a great range of physical conditions. Throughout most of their length the Sayan Mountains are bordered by a forest-covered broken mountainous district extending outwards one hundred miles or more, which is very difficult of access, and is inhabited by a small remnant of a Tungus tribe, who get a precarious living by hunting. Soon after the Yenisei River emerges from the precipitous gorge which it has cut for itself across the Sayan Mountains in working its way down from the Mongolian plateau, it enters the broad and fertile alluvial plains of Minusinsk, where the Abakan and Tuba rivers join it from opposite directions. This circular plain is one hundred miles, or more, in diameter, and, being completely encompassed by mountains, possesses climatic conditions different from those in any other portion of Siberia, and is fairly comparable to Italy. Here, also, as elsewhere remarked, large numbers of trees and plants flourish which are peculiar to the region.

Upon the east of this "oasis," a northwest-and-southeast projection of the same mountains, rising to a height of from 4,000 to 6,000 feet, separates the headwaters of the Kan from those of the Tuba. These mountains contain a vast amount of gold-bearing gravel, which, though rather low in grade,

has been very profitably worked by reason of the proximity of the fertile Minusinsk plains, which, by furnishing cheap food, diminishes the cost of production, so as to leave a fair margin of profit. At the same time, the demand created by the presence of a large mining population, has insured a good home market for the agricultural products, and so promoted a remarkable degree of prosperity. In addition to this, the Yenisei River furnishes a ready means for the transportation of agricultural products to Krasnoyarsk, where the markets have always been important by reason of the constant tide of emigrants and others travelers who cross the river at that point on their way between the east and the west. Large markets are also accessible farther down the river, where miners and hunters make their headquarters in districts too far north to obtain a local supply of breadstuffs.

On the west the district of Minusinsk is bordered by a low northwest-and-southeast range of mountains, which, for nearly two hundred miles, forms the watershed between the Chulym and Tom rivers in the Obi basin, and which does not wholly disappear until reaching the vicinity of Tomsk. About half way, however, a branch puts off to the right which follows pretty closely the west bank of the Yenisei River to Krasnoyarsk and one hundred miles farther north. For nearly one hundred miles of this distance the Chulym is separated from the Yenisei by this mountain range by a distance of only a few miles. A short distance above Krasnoyarsk the spurs of this range interlock with those which we have already described

upon the eastern side, and the river has cut its way through by a series of picturesque and most impressive gorges.

Below Krasnoyarsk, on the east side of the Yenisei River, there is a large and fertile agricultural region watered by the Kan, a tributary of the Yenisei, the Usolka, and the Tasneba which after uniting, empty into the Angara a short distance above its junction with the Yenisei.

Below the mouth of the Angara, upon the eastern side of the Yenisei, is a low complex of mountains nowhere rising above 3,000 feet, and covering many hundred square miles, which is rich in gold-bearing gravel, and has been the means of building up the enterprising city of Yeniseisk, its natural market town.

Farther north there are no economical interests except such as are connected with hunting, fishing, and, in the central portion, forests. From the first, hunting has been the prominent industry, while the fisheries and the forests remain yet to yield their vast products for the supply of the world's need.

The tundras of the far north extending from the head of the Gulf of Taz, on the Arctic Circle, to the Piasina River, are inhabited by the Samoyedes; while the great Taimur Peninsula is roamed over by bands of Tunguses, and the central portion of the province is occupied by Ostiaks, the Russian population being limited to the vicinity of the river and to the basin of the Angara, together with a broad belt extending westward from Krasnoyarsk towards Tomsk.

Geologically the border ridge of the Mongolian plateau is

composed of granitic rocks; while the belt of irregular mountains projecting to the northward is largely composed of gneiss and crystalline slates, the latter gold-bearing. These are, however, intersected by numerous dykes of eruptive material and veins of quartz. The broad plains consist of Silurian, Devonian, Carboniferous, and Triassic rocks, in which sandstones and limestones predominate. The Triassic period is represented by extensive fresh-water deposits, occasionally containing lignite and coal. Cretaceous and Tertiary deposits are found farther north.

The great geological changes which have taken place in recent times in the north are attested by the thousands of mammoths and rhinoceroses, whose remains are buried in the superficial deposits; in some cases the carcasses of the mammoth being found entire and undecayed. Elsewhere reference has been made to the facts reported recently by Stadling from near the northern boundary between Yeniseisk and Yakutsk, where far in the interior he found driftwood and remnants of the mammoth in a stratum of soil four to seven feet thick resting on pure ice of unknown thickness, which played the part of rock. The frozen condition of this region, therefore, preceded the advent of the mammoth, and from the character of the food found in his stomach (consisting of the twigs of trees such as now occupy the region) and of his woolly covering, the period of cold would seem both to have accompanied and outlasted his career. His extinction is probably connected with climatic changes which we have else-

where discussed in the general chapter upon the Geology of Siberia.

According to the census of 1897, the agricultural products of the province of Yeniseisk amounted to 16,355,841 bushels of grain, (of which Minusinsk should be credited with 6,443,-472 bushels, or considerably more than one third) and 2,393,850 bushels potatoes, (of which Minusinsk also produced about one third).

Of livestock there were 460,306 horses, 418,855 horned cattle, 657,716 sheep, 113,582 swine, 18,750 goats, 27,500 reindeer, 51,953 hives of bees, producing 2,784 cwt. of honey, 537 cwt. of wax.

The annual product of gold has been as high as \$3,500,000

The products of the forest were valued at 133,750 rubles, and of the fisheries at 90,135.

The manufactured products had a total value of 2,784,500 rubles, of which 1,590,896 were distilled liquors, 279,325 brick, 190,330 cast-iron products, 192,000 pumps, 129,655 tanned goods, 73,627 beet sugar, 72,262 products of tallow, 49,070 salt, 30,000 glass, 19,090 fine flour, 18,000 carriages, 16,015 products of oil, 15,000 wax, 10,600 rope, and 9,070 pottery.

The trade as carried on at nineteen fairs amounted to 650,289 rubles.

Educational interests are represented by 243 schools, with an attendance of 6,565 boys, 3,294 girls, making a total of 9,859. About one half of these are public, and the other half church schools.

But the higher interests of education are excellently served at Minusinsk, Krasnovarsk, and Yeniseisk by public museums of great interest and value, that of Krasnoyarsk containing 12,509 specimens carefully classified, arranged, and catalogued, of which 559 relate to domestic economy, 6,791 to natural history, 791 to ethnology and anthropology, 2,843 archæology, 444 to manufactures, 1,081 to numismatics. The museum at Minusinsk, occupying a brick building which is the best and most conspicuous in town, contains no less than 47,808 specimens, of which 16,796 relate to natural history, 1,746 to anthropology, 11,859 to archæology (illustrating more fully than anywhere else the transition from the stone, through the bronze, to the iron age), 967 to metallurgy, 2,048 to manufactures, 2,653 to household economy, 8,097 to education, 1,632 to pedagogics, 1,754 to numismatics, and 256 to laboratory methods. During the current year 2,007 specimens were added. In the year 1900 a building for the library was erected as a companion to the museum. The library already contained 14,438 volumes, and 18,400 pamphlets. There were added in 1900 744 volumes. The Yeniseisk museum contains 15,930 specimens, of which 1,177 were added the current year.

XXI

AMUR REGION

1. Amur

AMUR lies between the forty-seventh and fifty-sixth parallels of north latitude, and the one hundred and twenty-sixth and one hundred and thirty-fifth meridians of east longitude. It is bounded on the north by Yakutsk and Maritime Province, on the east by Maritime Province, on the south by Manchuria, and on the west by Manchuria and Transbaikalia. It has an area of 172,848 square miles, and a population of 118,570, of whom 66,595 are males, and 51,975 females, 32,606 being in the single city of Blagovestchensk. The province is bordered upon its entire southern portion by the Amur River, along which most of the European population is scattered, but extensive gold placer mines are worked in the upper portion of the Zeya, which is navigable for three hundred or four hundred miles. Nearly all the central and western portions of the country are mountainous and inaccessible. For two hundred or three hundred miles along the Amur River it has been impracticable to build a carriage road; so that between periods of navigation and the time when the ice is solid

enough to serve as a road bed, communication can be kept open only on horseback.

Above Blagovestchensk the valley of the river is narrow, and the area fit for cultivation is very limited. The population along this entire distance of six hundred or seven hundred miles consists principally of colonies which have been stationed by the government to provide horses for the traffic upon the river during the winter. Below the mouth of the Zeya the river flows through a broad and fertile plain, the principal drawback to the country being that the maximum rainfall occurs in July and August, too late in the season to be of best service to the crops, the total rainfall in the summer being upwards of eleven inches.

This province became a part of Russian territory by the treaty of Aigun in 1858, at which time there were a small number of Chinese, largely exiles, living within the territory, cultivating the fertile soil, on the north bank of the Amur below the Zeya River. These were allowed to remain, and to continue under the control of the Chinese laws. By the close of the century they had increased to about 30,000 in number, and were prospering in a marked degree, being the main dependence of the Russians for their local supplies of vegetables. As a result of the unfortunate attempt of the Chinese, in July, 1900, to capture and destroy Blagovestchensk and the Russian villages along the river, these Chinese villages were all burned and the inhabitants expelled.

The Amur, Zeya, and Bureya rivers furnish ready communication, by means of boats during the summer season, and of

sledges in the winter. As the population has been so largely employed in mining and transportation, agriculture has not received so much attention as in other portions of the empire. Nevertheless, the annual products have attained respectable proportions; the total amount of all kinds of produce harvested, according to the last report, being 1,308,710 cwt. of which 512,453 cwt. were oats, 504,436 cwt wheat, 55,664 cwt. buckwheat, 20,088 cwt. barley, 53,020 cwt. other grains; and 163,047.6 cwt. of potatoes.

Of livestock there were 49,100 horses, 44,577 horned cattle, 14,007 swine, 5,825 sheep, 506 camels, 40 goats, 30 mules.

The products of the chase were valued at 125,502 rubles; of the fisheries, 113,399; of the forests, 300,000; of the gold mines, 7,500,000; of the shops and factories, 1,031,554; of which 135,000 were distilled liquors; 75,500, beer; 455,149, flour; 151,708, leather; 63,000, brick. The trade of the year amounted to 6,832,719 rubles, of which 4,293,538 was Russian, and 2,539,181 foreign. Of the trade of Blagovestchensk, 3,279,668 rubles was Russian, and 1,301,101, foreign, 2,148,760 was with Transbaikalia, which evidently supplied a good share of their bread-stuffs.

Educational interests were represented by 73 classical schools of all grades, with a total attendance of 4,595, of whom 3,356 were males, and 1,239 females. But Blagovestchensk already has a well-equipped opera house, in which the best classical musical works are rendered, a museum and a rapidly growing public library.

2. Maritime Province

This includes a strip of territory between the forty-second and seventieth degrees of latitude, extending from Korea to the Arctic Ocean, inclusive of Kamchatka, and measuring 2,300 miles long with a breadth varying from 40 to 420 miles. It has an area of 715,982 square miles, with a population of 220,557, of whom 150,826 are males, and 69,731 females, the great disparity in sexes being largely due to the predominance of the military forces, and of prisoners in the island of Sakhalin. Of the cities, Vladivostok had in 1897, 28,933, of whom 24,433 were males, and 4,500 females, 12,000 of the population being soldiers, and 12,577 Chinese, Japanese, and Koreans, of whom 11,621 were males, and 956 females.

From these statistics the youth and rapid growth of the city may be inferred. The harbor being one of the most commodious and beautiful in the world, much resembling that of San Francisco, and it being so far south that it can readily be kept open by ice-breakers in winter, it is destined to be the great military fortress of Russia upon the Pacific coast. Hence its growth has been rapid, and has been so marked since the census of 1897, that that gives a poor representation of its present position. To say that it was likely to double in population once in ten years for some time to come, would probably be below the mark. Extensive government works for making and repairing ships, and large dry docks, insure the presence of a large population; while the agricultural resources of the surrounding country are great, and it will always continue to be the natural outlet for the products of Western Siberia, espe-

cially now that the Chinese Eastern railroad is completed, giving a direct connection with Transbaikalia, while the Usuri railroad, draws to it the traffic of the rapidly developing Usuri Valley, and diverts to its more genial port the vast traffic of the Amur River.

Nikolsk-Usuri, at the junction of the Chinese Eastern railroad with the line from Khabarovsk, is also a city of recent and rapid growth, containing already in 1900 a population of 10,000 or 12,000, but not likely to continue at any such rate as its neighboring seaport town is sure to do.

Khabarovsk, the capital of the province, situated upon a picturesque promontory at the junction of the Usuri and Amur rivers, has had a longer growth, having been founded immediately on the passage of the territory under Russian rule, in 1858; its present population being 14,933, of whom nearly one half are military. The museum of the National Geographical Society is large and of great value.

The other towns of the province are insignificant; Petropavlosk in Kamchatka having but 394, and Okhotsk but 197.

The native population consists of Tunguses and Mongols stretching all along the seashore from Vladivostok to the vicinity of Kamchatka, except that at the mouth of the Amur, and upon the northern end of Sakhalin, there are a small number of Ghilaks, and on the south end of Sakhalin some Ainos; while Kamchatka is occupied in the southern half by Kamchadales, and the northern half by Koriaks, and the rest of the coast as far as Bering Strait by Chukches.

The northern part of this region, ever since the Russian oc-

cupation, has been the paradise of hunters, supplying the world with the best and most highly appreciated furs; but so vigorously has the game been pursued, that some species have been entirely exterminated, while all are greatly diminished in numbers. The blue fox and the black sable have been exterminated, the whale that formerly drew hundreds of American vessels into the region, has almost disappeared. The sea otter, formerly so numerous on Bering Island, is nearly extinct, as is also the sea lion (*Otaria stelleri*); while the sea cow (*Rhytina stelleri*) has entirely disappeared, but the sea bear (*Otaria urisina*) has been partially domesticated, and furnishes an increasing supply of skins. The Chukches in the interior keep vast numbers of reindeer, there sometimes being as many as 10,000 in a herd. The Koriaks of the interior, also, keep large herds of reindeer, but all the natives upon the coast have deteriorated greatly by contact with foreigners.

The middle portion of the province consists of a narrow strip bordering the Sea of Okhotsk from Kamchatka to the river Ud, which enters the southwestern corner of the sea. A large share of this strip is only from forty to sixty miles wide, and is crowded in between the sea and the Stanovoi Mountains, which rise to a height of 6,000 or 7,000 feet. The steep incline, the innumerable narrow channels occupied by mountain streams gorged with water throughout the spring by the melting snow, and the dense forests of larch which cover the lower portion, render the country almost inaccessible; while the harbors of Okhotsk and Udinsk are so poor and inaccessible that they have drawn but little trade from the valley of the Aldan and

the Lena, notwithstanding the fact that the roads to them are the shortest, and were opened upon the first occupation of the country, in the latter part of the seventeenth century.

The southern half of the province is naturally divided into two parts, one of which consists of a broad low plain or valley, extending from the Sea of Okhotsk southward on both sides of the Amur River to its junction with the Usuri, and thence through the valley of the Usuri to Lake Kanka, and across the low watershed to Vladivostok and the Korean border, a distance of eight hundred or nine hundred miles, with an average width of about one hundred miles. This great valley averages only a few hundred feet above the sea, and would be admirably adapted to agriculture, were it not that the rains come at unseasonable portions of the year; the total rainfall averages twenty-four inches; twelve of this falls in the summer, mostly in the month of August, when it interferes with harvest. Just what adaptation of crops can be made to suit this peculiarity of the climate is one of the most important problems before the government of the province.

Between the Usuri River and the sea the Sikhota Alin Mountains present a continuous chain rising to an elevation of about 2,500 feet, with various peaks reaching to 5,000 feet; but their flanks are covered with such a dense growth of forests and underbrush, and the eastern side is so abrupt, that it has been found almost impracticable to cross them.

In the immediate vicinity of Vladivostok the climatic conditions are more favorable. But even here, though in latitude 43°, or about that of Marseilles, the average annual tem-

perature is 39° ; that of January is $+8.90^{\circ}$, and that of July 68° . The monsoons from the Pacific Ocean, which sweep up through the Ussuri Valley, occasionally produce tremendous floods, submerging wide areas of low land; so that the Amur River, broad as it is in its lower portion, often, in the latter part of summer rises fifteen feet in the course of a few days, and spreads out to a width of fifteen or twenty miles.

The agricultural products of the Maritime Province were, according to the last census, spring wheat, 262,948 cwt.; rye, 108,603 cwt.; barley, 35,234 cwt.; buckwheat, 33,417 cwt.; potatoes, 152,559.2 cwt.; millet, 101,518 cwt.; oats, 206,140 cwt.; market vegetables, 44,551.1 cwt.; while winter wheat was represented by a solitary harvest of 20 cwt.

Of livestock there were 36,826 horses, 55,826 horned cattle, 1,725 sheep, 31,630 swine, 221 goats, 190,618 reindeer, 33,300 sledge dogs, 394 mules. There were 10,699 swarms of bees, and 3,469,508 fish were caught.

The rewards of the hunters were in Kamchatka, 1,048 sables; in Okhotsk, 53,013 squirrels, 441 foxes, 210 bears, 20 wolves, 40 otters, 59 ermines, 2,857 moose, 2,969 sheep and goats, valued all together at 53,821 rubles. In the district of Ud there were added to this number 9 moose, 94 bear, 19 wild sheep, 351 sable, 153 foxes, 8 skunks, 25 otter, 200 seal. In Ussuri the total product was valued at 15,561 rubles.

The products of the shops and factories in 1896 were valued at 1,826,500 rubles; while the gold mines yielded 52,400 ounces, valued at \$987,216. In trade the imports at Vladivostok amounted to 243,215 tons, and the exports 63,444 tons, carried

by 267 vessels. Of the imports 46 per cent were from Russia, 19 per cent from China, 11 per cent from Japan, 9 per cent from the Northern Districts of the province, 8 per cent from England, 2 per cent from the United States, and 3 per cent from Germany, but this was before work had been begun upon the Chinese Eastern railroad, which was largely built by American material, and greatly increased the percentage from the United States. The exports from Vladivostok were to the northern districts of the province, 87 per cent; to China, 11 per cent; to Japan, 2 per cent; and to European Russia less than 1 per cent.

The Island of Sakhalin is now of chief interest as a penal colony, to which are sent criminals of the worst class, condemned to hard labor. It is about 600 miles long, stretching across eight degrees of latitude, and having an area of 32,000 square miles. The climate, in addition to being cold (the average temperature being that of Archangel, though the island is in the latitude of Lombardy), is also damp and foggy.

Sakhalin has a population of 33,261, of whom 20,080 are exiles, 8,927 are at liberty, and 4,254 belong to the native tribes. Of agricultural products, 81,637 cwt. were breadstuffs, and 189,270 cwt. potatoes. Of livestock, there were 867 oxen, 2,984 cows, 4,597 calves, 1,837 horses, 1,138 colts, 88 sheep, 3,298 swine. The gardens yielded 49,600 cwt. of cabbages, and 7,840 cwt. of turnips.

The island contains extensive deposits of valuable coal, in the mining of which the convicts are employed.

In the schools there are 755 pupils.

3. Manchuria

Since it is evident that, when once the Chinese Eastern railroad is completed, the Russians will have the practical control of Manchuria, it is in place to notice here its character and resources. The province contains about 400,000 square miles, being one third larger than Texas, but its shape is so irregular that fully 2,500 miles of its boundary adjoins Russian territory. The condition of the country is such that the population is distributed in a very irregular manner. The northern province of Tsitsikar, having 190,000 square miles, is largely mountainous, and is thinly populated. It contains unknown but probably vast mineral resources and extensive forests; while a fertile territory, now almost entirely unoccupied, extends for one thousand miles along the south bank of the Amur and its principal tributary, the Argun. Mr. Yugovitch, the chief engineer, speaks enthusiastically of the undeveloped agricultural resources in the valley of the middle Nonni River, and about the headwaters of the eastern branches of the Argun; while the valley of the Sungari River contains thinly inhabited prairies as extensive as those of the upper Mississippi, and apparently as favorable to cultivation.

The province of Kirin is likewise largely a mountainous district, especially throughout its southeastern portion, but contains also fertile plains along the Sungari River. Its resources are similar to those of Tsitsikar, and its minerals, though largely undeveloped, are probably of great value.

The most populous province is that of Lao-tung, which is penetrated by the branch line of the railroad running from

Harbin to Port Arthur. For a distance of four hundred miles, extending from the Sungari River to Niu-chuang, the railroad passes through a level, well-watered region, densely crowded with population, and, as far as the eye can see, under the highest state of cultivation. In a journey through it one scarcely sees an acre that is not planted and freed from weeds.

The total population of Manchuria is variously estimated at from 10,000,000 to 25,000,000; but there seems little doubt that Lao-tung alone has a population of as much as 12,000,000, and that the total cannot be much less than 20,000,000. These, however, are largely Chinese. The Manchus are a fading race, their success in arms having, as is often the case, led to their ultimate decay; for, ever since the establishment of the Manchu dynasty at Peking, in 1644, they have been drawn in large numbers to Peking, and to the garrisons stationed in all the principal Chinese towns. Here, living a comparatively idle life, and depending largely upon pensions from the general government for their support, they have become enervated; while the quality of those left behind in Manchuria has depreciated in character. The Chinese, on the other hand, have gradually invaded Manchuria till they carry on nearly all of its business, and swarm in all the centers of population; and are bringing under cultivation the vast areas of fertile land which, under the Manchus had been left to run to waste.

In estimating the wisdom and justice of Russian policy, both present and future, with regard to the occupation of Manchuria, we are not at liberty to forget that she found the central and northern parts of it practically in a state of nature. China

has done little more for the country than she had done for the region north of the Amur, to which she formerly laid claim. Indeed, nearly all the security to property which has been provided in the southern part of the province has been due to the formation of a "robber trust," which ultimately resolved itself into an "insurance company." The Chinese government is so weak and inefficient that robber bands have multiplied, especially in Manchuria, until all peaceful traffic was likely to be driven from the thoroughfares, so that there would be no business for any one. In anticipation of this calamity, the larger bands some time ago combined to put down the smaller ones, and establish a sort of independent government of their own; offering for a stated sum to give protection to merchants who wished to transport their goods from one place to another. The flags of the stronger organizations floating over a string of loaded wagons gave to the owners a fair degree of security, and, until the occupation by the Russians, were no uncommon sight. The "trust" did give some protection and was a nearer approach to government than had been made in the region by the Manchu dynasty from Peking. The northern part of this vast country has remained so long unsettled largely from the fact that this abnormal "insurance company" had not extended its beneficent control much beyond the headwaters of the Lao River.

Thus the first necessity of Russian interests centering in Manchuria is to keep an open line of traffic from Central Siberia to the Pacific Ocean. The military advantage of this would amply compensate Russia for all the expense of building

the road, even though it were not directly a financial success. This, however, it is likely to be. The export of coarse products from this center of Manchuria is, even under present conditions, immense. Of this the railroad will have almost a monopoly.

Even a cursory glance at the statistics in the chapters immediately preceding will do much to correct the impression that figures are necessarily dry. On the contrary, they are often better calculated to aid the imagination in the production of a lively picture than any verbal description could be. On the very face, the figures here given unroll before us a panorama of the most varied, interesting, and instructive character. The vastness of the territory, the extent of the natural channels of internal communication, the magnitude of the undeveloped resources, and the variety of the conditions of life all appear in the statistics relating to the boundaries and the drainage areas of the regions involved; while the history and condition of the varied populations are eloquently set forth in many incidental ways. It is instructive, for instance, to notice the absence of swine and of alcoholic products in the Mohammedan portions of the country, and to observe their increase northward in Turkestan and Siberia. The predominance of sheep and camels and mules in Turkestan, and their gradual relative diminution in higher latitudes until the census shows but five hundred camels and three mules in Tomsk, are not devoid of picturesque as well as of economic interest.

The prominence of "sheep's intestines" as an article of ex-

port is correlated with a special demand created in America at the Columbian Exposition in Chicago for a particular brand of sausage. The statistics relative to the products of the chase reveal at the same time the persistence of certain rather singular commercial demands, and the great falling-off of many natural supplies that were formerly the very life of Siberian enterprise. It seems that skunk-skins are still in such demand that they find a place in the census of more than one province, but the more valuable fur-bearing animals are everywhere verging on the border of extinction.

The educational statistics likewise in a very accurate manner reflect the entire social organization. Schools, both public and private, are everywhere found, and they are by no means of inferior order. But the smallness of the number of scholars enrolled shows at a glance that the peasant masses are still to a great degree innocent of the knowledge which is derived from books. Even elementary education in Siberia, as in European Russia, is limited, for the most part, to the well-to-do and official classes. Finally the smallness of the figures relating to commerce and manufactures shows the relative independence of the peasant families. For the most part they live within themselves, every household being a workshop where provision is made for most of its wants. Asiatic Russia has as yet scarcely entered upon the period of commercial enterprise and minute division of labor already long ago thoroughly established in Western Europe and destined soon to produce widespread and thoroughgoing changes throughout the whole vast empire.

PART IV

Social, Economic and Political Conditions

XXII

MEANS OF COMMUNICATION

Navigation

A MERE glance at a map indicating the distribution of the Russian population in Asia shows that the immigration originally followed the natural lines of communication, and that it has since continued into those areas where artificial roads and waterways could be easily constructed. As has already been noted, the natural waterways of Asiatic Russia have the disadvantage of affording no outlet for foreign commerce. The Siberian rivers all empty into seas that are ice-bound during a large part of the season, and are entered only with great difficulty, if indeed during some years they can be entered at all, within the short weeks when the long summer days clothe even the northern coasts with a rank vegetation.

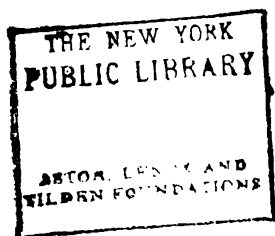
The Obi River empties into the long and narrow gulf of the same name which is through the entire year so clogged with ice that ships have never penetrated it for commercial purposes. The Yenisei River reaches the Arctic Sea under conditions more favorable to navigation, and occasionally merchant

ships have entered it with cargoes from Europe, and returned again laden with Siberian products; so that in the latter part of the nineteenth century high hopes were raised of this channel's becoming a permanent and profitable line of commercial exchange. But the hopes were based on the success of exceptionally favorable seasons, and the English company which was led to establish the line found it unprofitable, and definitely abandoned it. The Lena River has, in addition to the ice-bound sea into which it enters, a delta of enormous extent, with bars so shallow, and channels so shifting, that the regular entrance of sea-going vessels is entirely out of the question. A glance at the maps in the chapter on the climate of Siberia will show how short is the period during which the mouths of these rivers are free from ice; while a brief recurrence to the wild scenes which accompany both the freezing-up of the lower part of these streams, and the breaking-up of the ice in the spring and early summer, will impress one with the precariousness of any effort to use the Siberian streams flowing into the Arctic Ocean as channels of foreign commerce.

Nor is the Amur River of much more service for foreign trade. Though its mouth is a little below 52° 54' north latitude, which is about that of Hamburg, the climatic conditions are nearly the same as those of the Labrador coast in America; the Sea of Okhotsk being clogged with ice during a considerable portion of the year, and in the summer liable to typhoons of the most dangerous and destructive character. In winter the winds from Central Siberia pour outward over the Yablonoi Mountains with such terrific velocity that it is difficult for



Bridge Across the Yenisei at Krasnoyarsk. Terrace on the Right.



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either men or animals to face them; while in the summer, those from the Pacific Ocean are drawn with equal velocity towards the vacuum produced in Central Siberia, by the enormous and rapid change in temperature which takes place in the long days of that high latitude.

For a different reason, the great rivers of Turkestan are limited in their usefulness to commerce by the peculiarity of their outlets. The Syr Daria and the Amu Daria empty into the Aral Sea, whose navigation can be effected only by boats whose draft is too large to permit of their entrance to the rivers themselves; while the shallowness of the water and the liability to storms are such that little inducement is offered to any one who would endeavor to compete by water transportation even with the caravans that now conduct the trade along its shores.

The Caspian Sea, however, affords a most important channel for commerce. Being 740 miles in length, and 210 in breadth, and having a large number of commodious harbors, it serves to bring into easy communication with each other widely separated regions very diverse in character, while the Volga River opens up to its commerce a large part of European Russia. To say nothing of this river commerce, that upon the Caspian Sea had an enormous growth during the last quarter of the nineteenth century. Whereas in 1876 there were only 409 vessels entering the ports of the Caspian, representing 113,000 tons, in 1898 there were 213 steamers and 539 sailing vessels, which made altogether 20,114 port entries during the year. The naphtha flotilla of the Caspian Sea alone numbers fifty-

seven steamers and 263 sailing vessels, which in 1898 transported 30,000,000 hundredweight of naphtha or petroleum.

But the extent of the internal navigation upon Siberian rivers is enormous, and by reason of the interosculation of their tributaries, direct communication is afforded, as already said, with only short interruptions for a distance of several thousand miles in an east-and-west line across the entire breadth of the empire. Altogether Siberia has 27,843 miles of navigable rivers; all but 7,000 miles of which is open to steamers, while the two great rivers of Central Asia are navigable for a distance of 1,981 miles.

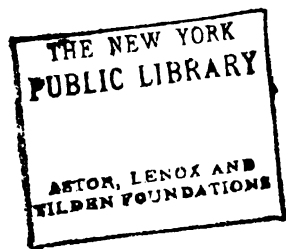
Beginning at Tiumen, steamers descend the Tura and Tobol rivers to Tobolsk, a distance of 268 miles. From Tobolsk they ascend the Irtysh River to Semipalatinsk, 1,521 miles. From Tobolsk down stream to the Obi, and up that river to Tomsk, on the Tom River, a little above its junction with the Obi, is a distance of 1,180 miles. From Tomsk again as a starting-point, one can ascend the Obi River by steamer for a distance of about 700 miles through Barnaul to Biisk, in the center of the Altai Mountains; or, again, the river Tom to Kusnetsk, a distance of nearly 300 miles; or yet again, branching off from the Obi 100 miles below Tomsk, one may ascend the Chulym River by small steamers through Achinsk, to Novoselovskoe, a distance, as the river runs, of about 600 miles, which brings him to a point which, as already described, is separated by only a few miles of easy portage from the Yenisei River at Chernova, about half way between Minusinsk and Krasnoyarsk. Or again, turning off from the Obi River below Tomsk



**Watering Station on the Siberian Railroad East
of Lake Baikal**



Sounding on the Upper Amur.



near Narym, he may follow up the river Ket for a distance of 425 miles, where a canal only five miles long has already been constructed to conduct vessels of light draught into the Kas, a navigable stream 130 miles long emptying into the Yenisei not far below the mouth of the Angara. This canal can be easily enlarged to accommodate ordinary river boats.

Once on the Yenisei, boats can descend without difficulty 600 miles to Turukhansk, at the mouth of the Lower Tunguska, and, if need be, to the mouth of the river 600 miles farther; or, ascending the river, steamers can reach Krasnoyarsk, a distance of 200 miles, and Minusinsk, 250 miles farther. Or, turning up the Angara, steamers can readily, when the government shall have properly improved the navigation along various rapids, ascend to Lake Baikal, a distance of more than 1,000 miles, where water communication is open through the length of the lake, 400 miles, and for 300 miles up the Selenga, and for a short distance up the Bargusin and Upper Angara rivers.

Crossing over from the Ilim, a tributary of the Angara, by a short portage, to a tributary of the Lena, one meets navigable waters at Ust-kutskoe, whence steamers regularly ply on the river to Yakutsk, 1,440 miles, and occasionally to the mouth of the river, 1,000 miles farther. More or less use, also, for navigation can be made of the lower part of the Vitim, Olekma, and Aldan rivers. Thus, with short interruptions, water communication is available for commerce along an east-and-west line across the plains of Siberia from the Ural Mountains to the western border of the Yablonoi range for a distance of

more than 3,000 miles; or, by the channels which have to be followed, of more than 4,000 miles.

According to the last reports, there were plying on the rivers in the basin of the Obi, 114 steamers, representing 5,000 tons; on the Yenisei and Lena, forty-one steamers, representing 2,000 tons; and on the Amur and its tributaries, 116 steamers, representing 4,000 tons; making altogether 250 steamers with a tonnage of 11,314.

Still further these internal waterways of Western and Central Siberia are separated from the navigable waters of the Amur by a distance of only about three hundred miles, much of which is penetrated by streams which could be rendered navigable for moderate-sized boats a part of the year. Taking advantage of this fact, it will be seen a little later that engineers as long ago as 1857 proposed to construct a short railroad connecting these water systems at that point.

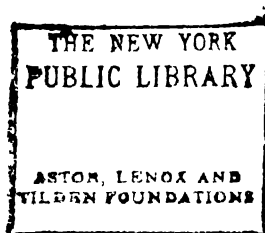
On reaching the headwaters of the Amur a good-sized continent is opened to steam navigation. From Stryetensk steamers run regularly 2,000 miles or more to Nikolaievsk, at the mouth of the river, and several hundred miles up each of the great tributaries,—the Argun, the Zeya, the Bureya, the Sungari, and the Usuri.

Post Roads

Notwithstanding the enormous network of internal lines of water communication across Siberia, the use of it suffers a serious drawback in the zigzag course it necessitates, and in the fact that for more than half the year it is closed to navi-



A Private Sledge.



gation by the ice which forms early in the autumn, and disappears late in the spring. Hence it became necessary, at an early date, to build post roads to the extremities of the continent, in order to make communication possible during the autumn and spring, and to facilitate it in the winter and summer. A great military road, therefore, with numerous branches was built early in the eighteenth century, while additions have been provided as necessity required. Naturally this follows what has been the main line of immigration leading through the most fertile portions of the territory.

Beginning at the Ural Mountains between the fifty-fifth and the sixtieth degree of latitude, N., a number of roads, crossing the rich steppes which are watered by the branching tributaries of the Tobol and Ishim rivers, converge upon Omsk, on the Irtysh River, five hundred miles to the east. Proceeding in the same direction, the united streams of travel, passing through Kainsk cross the Baraba Steppes, and reach the main branch of the Obi River after a distance of four hundred miles; thence onward, leaving Tomsk fifty or sixty miles to the north, and passing through Mariinsk, and Achinsk, it reaches the Yenisei River at Krasnoyarsk after a course of about five hundred miles; thence through Kansk and Nijni Udinsk, Irkutsk is reached, after a distance of a little less than seven hundred miles. But from Obi an important branch with radiating arms penetrates a rich prairie region for several hundred miles southward to the important mining centers of Barnaul, Biisk, Kusnetsk, and the towns on the Irtysh River above Semipalatinsk; while at Achinsk a branch runs 250 miles

to Minusinsk, and from Krasnoyarsk one of equal length to Yeniseisk, and for several hundred miles farther down the river to Turukhansk.

Starting from Irkutsk, a main line branches to the north-east and strikes the head of the Lena River, about 100 miles distant, whence a post road follows down the stream to Yakutsk, a distance of 1,800 miles, thence crosses to Okhotsk, 700 miles, thence, by a long detour, to New Kamchatka, 2,350 miles, thence to the fortress of Petropavlosk, on the Pacific, 200 miles, making a total of more than 5,000 miles.

The other branch from Irkutsk, crossing Lake Baikal in summer and winter, but going around the southern end in spring and autumn, reaches Stryetensk, on the east side of the Vitim Plateau, after a course of 700 miles, having put off branches on either side at Chita and Nerchinsk; thence, following the course of the navigable streams, the post road keeps communication open in the winter to Khabarovsk, 1,370 miles.

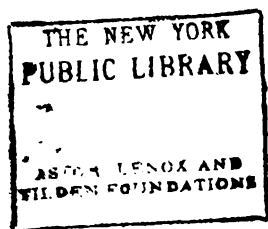
So excellent is the system of post roads along the main line, that, except in the late autumn, when the ground is beginning to freeze, and in the spring, when the frost is coming out, travel is both easy and rapid, and not very expensive. Post houses occur at intervals of from twelve to twenty miles, at which a public official is stationed with his family who is bound to keep a certain number of horses, usually from fifteen to thirty, with about one third as many drivers and tarantasses or sledges, all of which are at the command of travelers at reasonable rates. Three horses is the average number attached



Kirghiz Village on the Border of the Desert.



Blacksmith Shop on the Military Road South of Lake Balkash.



to the vehicle, and the charge made is from one cent to two cents a mile for each horse.

The Russian officials usually travel both night and day, frequently covering more than two hundred miles in twenty-four hours. But if one wishes to rest nights, the post house is provided with one or two cots and plenty of space upon the floor, upon which he can lie down, being expected to furnish his own blankets or bedding. For food, he is supplied with black bread, and a samovar of hot water with which he can make his own tea, and he can usually obtain eggs and milk; the charge for all being barely nominal or left to the judgment of the traveler. In an actual trip of one thousand, four hundred miles by tarantass in the summer of 1900 in which three horses were usually engaged, the total expense, including provisions, was less than six cents a mile for the two who formed the party. So little do the Russians make of a long journey by tarantass or sledge that one not infrequently meets two ladies traveling together between points many hundred miles distant.

Railroads

The vast agricultural plains and the remote mining and lumber regions of Siberia, like those of the United States and Canada, have long waited the advent of the iron rail and of the locomotive to insure their full development. Projects for building a trans-continental Siberian railroad began to be formed as early as the middle of the nineteenth century, being

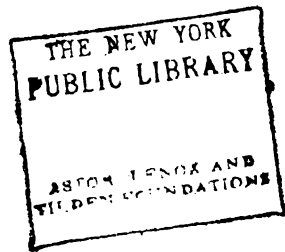
specially incited by Muravieff's activity in opening a new outlet for Russia to the Pacific through the Amur River. The first of these, proposed in 1857, was, however, merely for a carriage road which might later be turned into a railroad between Sophiisk, on the lower part of the Amur, and the Bay of De-Kastri, on the Gulf of Tartary, following the depression occupied by Lake Kizi. The acquisition of the Usuri River soon after, and the diversion of trade from the mouth of the Amur to the harbor at Vladivostok, however, prevented the completion of this plan.

The same year (1857) witnessed a proposition to construct a tramway for horse cars from Perm, in the valley of the Volga, to some port on the Pacific Ocean. As horses are abundant and cheap throughout the central portions of Siberia, this project is not so visionary as it might seem. For 150 years travelers have been rapidly conveyed across Siberia by horses in ordinary carriages over rough roads, and they are still conveyed in this manner over many thousand miles of ordinary post roads. But the age of steam was too near at hand to think of running horse-cars five thousand miles.

In 1857, also, an enthusiastic American engineer, Mr. Perry McDonald Collins, under appointment as United States Commercial Agent at the Amur River, went overland from Moscow giving special attention to the possibility of improving communication by a railroad. After careful examination of the region between Lake Baikal and the Amur, Mr. Collins proposed to Muravieff (who was then in the height of his power and deeply engaged in his plans for the opening of the Amur



Steamboat Landing on the Irrysh River.



and its occupation by Russian settlers), to connect the water communication on Lake Baikal and the Yenisei Valley with that of the Amur by a railroad from Irkutsk to Kiakhta and from there across the Vitim Plateau to Chita. "What is necessary," he writes, "is to assist nature a little and by building this road make the heart of Siberia easily accessible to commerce, so that her products can be quickly and readily exchanged or transported to the ocean by way of this railroad and the Amur, where a ready market can be found." But although Mr. Collins's plan was favored by Muravieff, the government was not prepared to take it up and carry it to completion.

During the next twenty years various other projects for a trans-Siberian railroad were in succession brought before the public and to the notice of the government. Among the most likely of these was that of Liubimoff, a wealthy merchant, who proposed a road about five hundred miles long, starting from Perm and crossing the Ural Mountains so as to connect the water communication of the Kama and Volga rivers with that of the Obi Valley near Kurgan, on the Tobol. This and one or two other parallel propositions had the advantage of meeting local demands, since they followed in line both of Yermak's original conquest of the country and of the great tide of settlers who had taken permanent possession. Liubimoff's proposed road crossed the Tobol at the exact point afterwards chosen by the promoters of the present system.

Plans for the more perfect utilization of the waterways and their combination with independent railways to shorten the distance continued for some time to occupy the public atten-

tion. Ostrofski, another engineer, proposed in 1880 a road from Perm to Tobolsk joining the Kama with the Irtysh, thence the use of the river systems to Tomsk and a railroad to Krasnoyarsk, on the Yenisei, which it was hoped could be connected with Irkutsk by improving the navigation of the Angara River. A line was also proposed from Omsk to Barnaul connecting the Irtysh and the Obi in their upper portions, and facilitating access to the mining regions of the Altai Mountains.

Siedensner, another engineer, about the same time pushed with great vigor a plan for a still larger development of the waterways. He was in favor of the canal through the river Ket connecting the Obi with the Yenisei, and of the improvement of the navigation of the Angara; so that steamers of adequate size could make the entire passage from Tiumen to Lake Baikal, a distance, as the steamers would run, of 3,300 miles. He thought it possible, also, by slack-water navigation up the Selenga and its tributaries on the west, and the Shilka and Ingoda on the east, to reduce to twelve miles the actual land portage over the Yablonoi Mountains. This part of the plan was indeed very much like that which was carried into execution in the early part of the nineteenth century by the State of Pennsylvania in building a canal across the Alleghany Mountains.

By the year 1890 the Russian railroads had extended their lines across the Ural Mountains, one of them having reached Tiumen, and the other Mias, some distance west of Cheliabinsk, on the line of the present road.

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The time was now ripe for the promotion of the grand scheme of the transcontinental Siberian railway which was undertaken by the government. Taking advantage of the railroad already completed from Moscow through Samara and Ufa across the Ural to the vicinity of Cheliabinsk, a distance of nearly 1,200 miles, the road was made to continue its course eastward nearly in a direct line through the heart of the rich agricultural district lying between the fifty-fourth and fifty-sixth degrees of north latitude, and touching all the principal towns which had grown up along the line of the original post road extending from the Ural Mountains to Irkutsk, a distance of 2,030 miles.

There is no better way of getting an impression of the advancement already made in the settlement of the country than by following the line of this railroad eastward from Cheliabinsk, and noticing in order the principal stations, with the population of the districts of which they are the centers of trade. We will give them in tabular form, noting not only the size of the particular village or city in which the station is situated, but also the population of the contiguous territory, and such trade statistics as are accessible. It will be noticed that owing to the narrowness of the territory and its great length and the number of navigable rivers crossed, this single line of road supplies almost the entire necessities of the empire, being in this respect absolutely unique among all the railroads of the world.

	Distance in miles.	Population.	Exports.
Cheliabinsk .....	.....	10,719	Cwt. of grain. 24,000
Chernyavskaya.	27½	5,000	.....
Chumlyak.	54½	{ In 34 villages 30,000	159,697
Shumikha.....	77½	{ In 35 villages 40,000	800,000
Mishkino.	103½	{ In 15 villages 20,000	849,321
Urgamitch	125½	{ In 8 villages 7,000	280,000—360,000
Zyryanka	136½	{ In 6 villages 4,000	80,000
Kurgan	160½	{ In 132 villages 68,000 c. 10,572	1,603,066
Vargatchi.....	184	.....	40,000
Lebyazhya	212	{ In 60 villages 38,000	200,000
Makutchino.....	241½	{ In 40 villages 20,000	600,000
Petukhovo	271½	{ In 5 villages and 10 hamlets 8,000	200,000
Mamlutka.	298½	{ In 10 villages 4,000	40,000
Petropavlovsk.	326½	c. 19,637	*22,000,000
Tokutchi	348	.....	.....
Medvezhya	378	.....	.....
Isil Kul.....	410½	{ In 20 villages 10,500	19,812
Kochubaevo.....	438	.....	.....
Marianovka	466	.....	8,969
Post of Omsk.....	494		
Omsk	496½	(99) c. 50,768	More than 400,000

* Rubles' worth of commerce.

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	Distance in miles.	Population.	Exports
Kormilovka	526 $\frac{2}{3}$	130	Cwt. of grain. 4,814
Kalatchinskaya.....	546	5,000	40,000
Tchadrinskaya	592	{ (Russian) 2,000 In 5 villages (Luth'n) 2,000	32,464
Tatarskaya	602	{ In 15 villages	*6,000 120,000
Karatchi	634 $\frac{2}{3}$	{ 25,000 In 13 hamlets and 9 villages	160,000
Tebisakaya.	664	{ 9,000 In 10 hamlets and 4 villages	40,000
Kainsk.....	699 $\frac{1}{3}$	{ 8,000 In 17 villages c. 5,858	200,000
Kozhuria.....	726	{ 4,000 In 18 villages	.....
Ubinskaya	751 $\frac{1}{3}$	{ 3,500 In 12 villages	.....
Kargatskaya.....	777 $\frac{1}{3}$	{ 1,200 In 5 villages	20,000
Chulym.	800	{ 1,200 In 5 villages	36,000
Duplenskaya.....	832	{ 1,000 In 4 villages	.....
Kochenevo	856 $\frac{2}{3}$	{ 3,000 In 7 villages	200,000
Krivoshchekovo.....	882 $\frac{2}{3}$	{ 16,000 In 16 villages c. 11,700	400,000
Obi.....	888	c. 15,000	2,000,000
Sokur.	916	700	.....
Oyash.....	944	653	25,275
Bolotnoe	972	500	.....
Polomoshnaya	998	500	.....

* Cwt of butter.

	Distance in miles.	Population.	Exports.
			Cwt. of grain.
Litvinovo	1,015½	.....	.....
Taiga.	1,036	2,000	.....
Sudzhenska	1,060¾	In 9 villages	.....
Izhmorskaya	1,083½	v. 650	36,877
Berikulskaya.	1,107½	.....	54,523
Mariinsk	1,128¾	c. 8,300	108,154
Suslovo	1,144	1,861	8,873
Tyazhin	1,166¾	1,206	17,357
Itate.	1,188¾	v. 2,546	20,558
Bogotol.	1,212	v. 4,673	.....
Krasnaya	1,232¾	v. 3,167	.....
Achinsk.	1,254¾	c. 6,714	*32,722
Tarutino	1,268	v. 1,726	.....
Chernorechinskaya	1,278¾	v. 1,406	.....
Kemchug	1,308¾	833	.....
Kacha	1,334¾	115	.....
Minino	1,354	4,500	.....
Krasnoyarsk	1,365½	c. 27,299	.....
Yenisei.	1,367½	.....	71,591
Zykovo	1,384	{ In 1 village and 1 hamlet	.....
Sorokino	1,399½		.....
Kamarchaga	1,415½	1,260	.....
Balai	1,418	836	.....
Olginskaya	1,446	1,248	.....
Troitsko-Zaozernaya	1,464¾	{ In 2 villages	
Tyrbyl.	1,478		

* 30 or 40,000 rubles' worth per annum.

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	Distance in miles.	Population.	Exports.
			Cwt. of grain.
Petrushkovo	1,493½		
Kansk	1,515½	c. 7,504	90,833
Ilanskaya	1,532¾	874	.....
Ingashe	1,550¾	574	.....
Tipakaya	1,567½	804	.....
Kluchinskaya	1,587½	207	67,798
Urtý	1,602	470	.....
Taishet	1,620¾	1,600	.....
Baironovka	1,634	900	.....
Razgon	1,650¾	.....	.....
Alzamai.....	1,664¾	840	.....
Zamzor	1,677½	225	.....
Kamyshet.....	1,691½	200	*45,000
Uk	1,702¾	900	.....
Nijni Udinsk.....	1,720	c. 5,803	.....
Khingui	1,734¾	400	.....
Khudoelanskaya.....	1,749½	500	.....
Kurzan	1,772	370	.....
Tulun.....	1,792¾	5,000	7,200
Azey.....	1,805½	.....	.....
Sheragul.....	1,818¾	1,800	.....
Kuitun.....	1,842	2,350	.....
Kimiltei	1,862	3,300	.....
Zima.....	1,879½	2,860	.....
Tyret	1,893½	17,000	.....
Zalari	1,914½	1,650	.....
Golovinskaya	1,928	172	.....
Kutulik	1,941½	1,996	.....

* Tons cement.

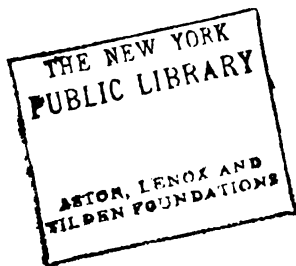
	Distance in miles.	Population.	Exports.
			Cwt. of grain.
Cheremkhovo	1,955½	2,276	.....
Polovina	1,969½	300	.....
Malta	1,983½	2,000	.....
Teima	1,997½	8,000	*120,000
Sukhovskaya	2,013½	300	.....
Innokentevskaya	2,029½	.....	.....
Irkutsk....	2,034½	c. 51,434	†19,604,500
Lake Baikal.	2,077½	.....	.....
Verkhni Udinsk	2,180	8,002	.....
Petrovsk ...	2,269½	3,673	‡20,000
Bada	2,331½	1,230	.....
Chita	2,508½	11,480	.....
Nerchinsk.....	2,713½	6,713	.....
Stryetensk.....	2,767½	8,000	.....
Shilkinsk.....	2,826½	957	.....
Albazin.	3,135½	786	.....
Blagovestchenak.....	3,541	32,606	.....
Ekaterino-Nikolsk.	3,895½	1,195	.....
Khabarovsk. ...	4,143½	14,971	.....
Spasskaya.....	4,472	1,068	.....
Chernigovka	4,497½	1,299	.....
Nikolskoe	4,552½	15,000	.....
Vladivostok	§4,620½	28,933	.....

* Salt. † Rubles' worth of manufactures. ‡ Cwt. of pig iron per annum.
§ Or 6,624 s-3 miles from St. Petersburg.

In the above list nearly all the villages of less than one thousand inhabitants after leaving Stryetensk have been omitted, but stations both on the Amur River and on the



String of Camels in Turkistan.



MEANS OF COMMUNICATION 437

Usuri railroad, many of them accommodating a population of several thousand, occur along the entire line at intervals of fifteen or twenty miles.

The Chinese Eastern railroad, branching off from Kaidalova, 522 miles east of Lake Baikal, and 168 west of Stryetensk, pursues a direct line to Vladivostok, saving a distance of 800 miles. By this route the total distance from St. Petersburg to Vladivostok is 5,800 miles, and by turning off at Harbin, 400 miles west of Vladivostok, the distance to Port Arthur, in round numbers, is 6,000 miles; or, again, by turning off from the Port Arthur line at Niu-chuang, 150 miles above Port Arthur, Peking may be reached by rail at a distance of about 6,300 miles from St. Petersburg.

The significance of the contemplated road from Irkutsk or Verkhni-Udinsk, through Kiakhita, Urga, the Gobi Desert and Kalgan, to Peking, will be seen by noting, that it would be a still further saving of about 900 miles, bringing Peking within 5,400 miles of St. Petersburg, within 3,400 of Cheliabinsk, and within 1,300 miles of Irkutsk.

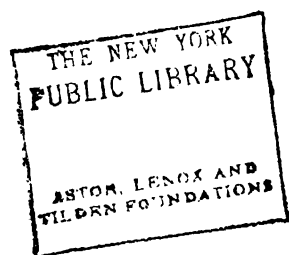
XXIII

CAPACITY FOR DEVELOPMENT

THIS rapid summary of the physical geography, climatic conditions, history, conquest, colonization, development, and natural resources of the Asiatic provinces of the Russian Empire prepares the way for a better understanding of the problems which present themselves both to the people and the government, and for a more intelligent forecast of their future. After even a brief study of the details already presented, one can readily understand why the development of this country has been so long delayed, and can appreciate the advantages to be derived from the improved methods of modern transportation. It is only by the introduction of steam that the interior region has been brought into such contact with the outside world that its limited natural resources can readily be supplemented by the wider range of both natural and artificial products which are essential to the highest civilization; while at the same time these improved methods of transportation and communication have enabled the central government to extend its influence more effectually everywhere and to administer its affairs more wisely.



Scene on Lake Baikal.



Increase of Population

The expansion of Russia has been aptly compared to that of a glacier whose slow but steady accumulations of snow find relief in an outward movement all around the margin wherever lines of least resistance are offered. Owing to their social organization, their religious ideas and their natural temperament, the Russians are the most prolific race in Europe, the annual birth-rate for European Russia being 46 3-10 to the thousand as compared to a death-rate of 33 6-10, leaving at the present time an annual surplus of births amounting to 1,613,377. This rate of increase has been for 200 years so steady that it can pretty safely be counted upon to continue. In 1722 the population was but 14,000,000; in 1815 it was 45,000,000; in 1835, 60,000,000; in 1851, 68,000,000; in 1859 74,000,000; in 1897, 135,000,000; or, subtracting from the last figures, the number added by annexation, which may be roughly calculated at 15,000,000, the population at the end of the nineteenth century, belonging to the natural increase, was approximately 120,000,000. From these figures it appears that by the natural increase alone the population of Russia doubles once in about sixty years.

There is, therefore, a considerable surplus of population in Russia always ready for emigration. It is not, however, to be assumed that this increase of population could not have been provided for in Russia itself, but simply that under the existing social and agricultural conditions the virgin soil in Siberia, as in Canada and the United States that of the great northwest, has seemed to be, and probably really is, more attractive than

the waste and worn-out lands in the settled portion of the country which demand higher cultivation, and to secure that, an amount of capital which it is not easy for the peasant to obtain. Siberia, therefore, has steadily added to its population by immigration as well as by the natural increase. The extent and growth of the immigration to Siberia in recent years may be appreciated by glancing at the statistics, giving the number of immigrants carried on the steamers which run on the Obi and Irtysh rivers. In 1888 there were 26,129; in 1889, 30,410; in 1890, 36,000; in 1891, 60,000; in 1892, 100,000; in 1896 and 1897 nearly 200,000 each year; while since the railroad has been running, and emigrants have been carried to the Usuri region by way of Odessa, the Suez Canal, and Vladivostok, the annual increase by immigration amounts to considerably over 200,000.

At the same time the birth-rate in Siberia is higher even than that in European Russia, being 46 8-10 to the thousand in Siberia and only 46 3-10 in Russia, while the death-rate in Siberia is slightly less, being 33 4-10 to the thousand as compared with 33 6-10. The annual addition to the population by the excess of births over deaths in Siberia is 80,143; in the Caucasus, 151,485; in Central Asia, 33,681 making a total of 265,309. On comparing the census of 1897 with that of 1859 it appears that the population of the Caucasus increased during the thirty-seven years (exclusive of annexations) 95 per cent, and Siberia 130 per cent; whereas the total increase of population in the Empire during that period was but 83 per cent, including that by annexation.

Agricultural Area

In endeavoring to forecast the future of this great domain it is essential to form some estimate of the available resources of the country with reference to its ability both to support a large population, and to put at their command the varied elements of culture and comfort which belong to a high state of civilization. Of these resources those relating to the agricultural interests are of course predominant. But the climatic and physical conditions of the region are so peculiar that the general statistics must be carefully analyzed before a true conception can be formed of the full resources of the dominion.

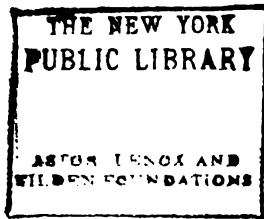
The total area of Asiatic Russia is estimated, as said at the outset, at 6,564,778 square miles, of which 4,833,496 belong to Siberia proper, including the region of the Amur and that bordering the Pacific coast; 1,548,825 belong to Central Asia, and 94,182 to Trans-Caucasia. But by far the larger part of Siberia consists of tundra and of forest belts where agriculture is practically out of the question, on account either of the shortness of the summer and the extreme severity of the winter, or of the mountainous character of the country. So that, after eliminating the portions unfitted to agriculture, it is estimated by Ballod, who has given special attention to the subject, that there are only about 500,000 square miles of arable land in Siberia proper, lying principally between 55° and 58° 30' north latitude, extending, however, in the Altai region to 51°. Of this, 192,000 square miles are in West Siberia, mostly along the upper portions of the Obi River and its tributaries; 20,000 in the steppe region of Akmolinsk and Semipalatinsk; 100,000

in East Siberia ; 85,000 in Transbaikalia ; 40,000 in Amur ; and 63,000 in Usuri.

This would make for Siberia alone a cultivable area nearly equal to that contained in what are called the twelve north central States of the United States of America, namely, Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas ; for, though these combined have an area of 753,550 square miles, the amount of waste and desert area included is fully sufficient to bring the area of cultivation down approximately to the same limits as in Siberia, while the climatic conditions, the nature of the soil, and the proximity of both regions to other natural resources are strikingly similar ; coal and copper and iron being found in convenient localities in both regions. In both cases, also, vast forests and outlying pasture lands surround the margins, and great river systems facilitate all kinds of internal commerce. Even with the present methods of extensive, and consequently low-grade cultivation, this portion of the United States sustains a population of 26,000,000 or forty-five to the square mile of arable land ; while the corresponding portion of Siberia now has a population of only about 5,000,000, or about ten to the square mile. Even, therefore, when this portion of Siberia attains the stage of progress already reached in the Mississippi Valley, it will have a population of about 25,000,000 ; while, upon reaching the stage of development already attained in the most highly cultivated portions of European Russia, it will easily sustain a population of 50,000,000.



Two Market Scenes at Omsk.



Wasted Water Power

The utilization of the water-power of Siberia is likewise one of the most feasible means of promoting the internal welfare. The line of mining and agricultural interests in Central Siberia is bordered on the south by a lofty mountain ridge; which condenses the vapors from the skies, and sends floods of water down through innumerable river channels where there is power enough wasted to provide, when properly used, for all the transportation and lighting of the region, and possibly to a considerable extent to furnish the homes with warmth, thus dispelling the two elements of discomfort and gloom which now characterize the long winter nights. The Angara River is as large and as constant as the Niagara, and its fall between Lake Baikal and Irkutsk is half as great as that between Lake Erie and Lake Ontario. There is no reason why it should not be utilized in the interests of all the region about Irkutsk as the Niagara is for that about Buffalo.

One can, also, easily see, upon no distant look into the future, that the enormous forest belt in Siberia will be a source of untold wealth to the country. Railroads will in due time penetrate all that region as they have penetrated the similar but smaller areas in Michigan and Wisconsin, and put within reach of the people in the agricultural district cheap lumber for their houses, thus enabling them by an easy exchange of their produce to maintain the high standard of comfort to which they have become used in the early settlement of the country, by reason of close proximity of the forests to their

farms. By improving the means of transportation, a practical proximity can be indefinitely maintained.

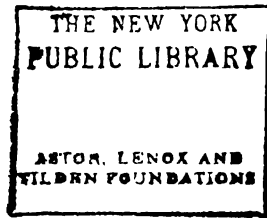
Summer Resorts

Another attractive element throughout the whole of the Asiatic dominions is to be found in the accessibility everywhere of summer resorts. This great advantage arises from the fact that the more thickly settled portion of country is always to be along the agricultural belt threaded by the Trans-Siberian railroad, where the main centers of population must continue to be. But over comparatively short distances up the rivers, and over branch railroads which are sure to be built, the crowded population can easily reach those attractive mountain heights which can never be utilized by a permanent population, but where pleasure and health resorts will find every provision of nature for their requirements. A celebrated mineral spring in the Minusinsk district already attracts invalids from all over Western Siberia. The picturesque valleys and the glacier-clad summits of the Altai and Sayan Mountains present scenery as attractive as that of the Alps. Lake Baikal, also, is so completely surrounded by mountains that it must ever retain the grandest solitudes of the world where the weary can find rest, thus amply compensating for the lack of seaside resorts which is incident to a country so far in the interior.

In view of the prospective development of the mining interests and fisheries, the utilization of the forest products, as well as of the enlargement of the arable area and the increased fertility effected by scientific processes, it is within



Fishing Camp on Lake Baikal.



the limits of reason to expect that there will be in Siberia alone a population of 50,000,000 at the close of the twentieth century, and of 100,000,000 by the middle of the twenty-first.

The agricultural resources of the other portions of Russia's Asiatic dominion have been more fully developed,—Turkestan and the Caucasus being the seats of some of the oldest civilizations of the world where agriculture has at times attained its highest perfection. Indeed it would seem from the reports of the historians recounting the triumphal march of Jenghiz Khan in the thirteenth century, and later Tamerlane, that Central Asia was then much more densely populated than now; several cities like Samarkand, Balkh, and Merv having populations of several hundred thousands each; while everywhere throughout the agricultural belt bordering the mountains there is abundant evidence of much more extensive irrigation than is practiced at the present day.

Irrigation

Although there is much reason to suppose that formerly the rainfall throughout this region was greater than it is at the present time, it is not probable that the diminution has taken place to any appreciable extent during the last few hundred years, so that there would seem no difficulty, from lack of water, of restoring again the agricultural prosperity which characterized the country in the time of Tamerlane and Jenghiz Khan. The belt of fertile loess which borders the high mountains is by no means all brought under cultivation, nor is the water of the mountain streams all utilized for purposes of

irrigation. It needs only a wise central government, with power to carry out comprehensive plans to secure astonishing results in enlarging the area of cultivation.

In the province of Semirechensk a large part of the water of its seven streams is permitted to pass through the loess belt in deep-cut channels, leaving the soil unfertilized, and the water to waste itself in the pestilential lagoons surrounding Lake Balkash. The Aral Sea likewise still receives the larger part of the life-giving streams coming down from the lofty heights of the western part of the Tian-Shan range, through the channels of the Syr Daria and the Amu Daria. While protecting all the interests of the lower part of these rivers, an immense amount of water now wasted might easily be diverted to the rich loess-covered areas near the mountains which are now barren from lack of moisture. Of course, to secure these advantages in the upper portions of the river valleys without interfering with the interests of the population depending upon the water in the lower part of their courses is a problem of the greatest delicacy and difficulty, and will tax to the utmost both the political wisdom and the scientific skill of the governing race. But no doubt it can be done, and the pressure of the increasing population which is sure to follow, and is already following, the settled condition of things under Russian occupation, will compel attention to these natural means for the increase of the agricultural resources. We may therefore look forward to the abolition at no distant day of both Lake Balkash and the Aral Sea; for all the water which now reaches them may as well be evaporated from fertile irrigated

fields as from these useless lake basins. Whereas the present population of these central Asiatic provinces amounts to only a little over 5,000,000, it may, like that in Egypt under English rule, be easily doubled before the middle of the twentieth century and without much difficulty quadrupled by the end of the century.

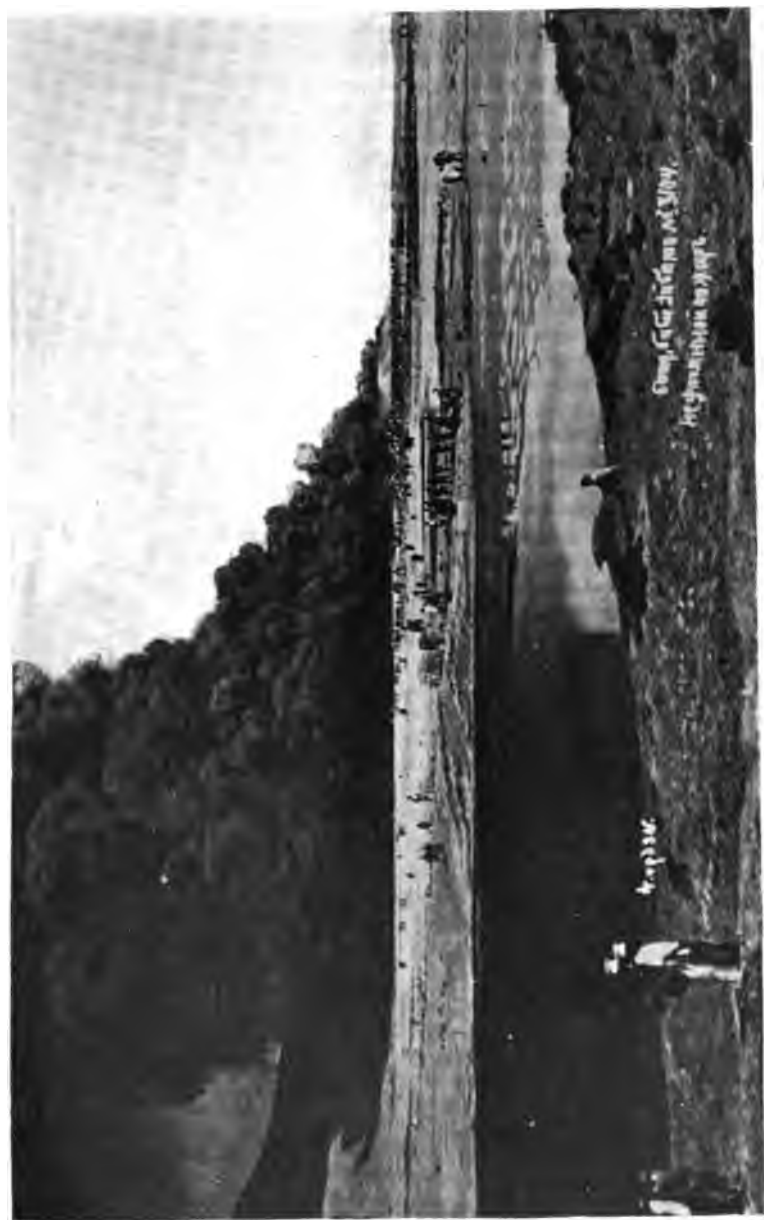
Western Turkestan, now occupied by the Russian provinces in Central Asia, has always maintained a remarkable degree of self-dependence, being shut off from commerce with the outside world, except by the expensive methods of camel transportation. It has exported little but products of the most costly character, and imported only delicacies so expensive as to be within the reach of none but the rich, and objects of taste appreciated only by the few. The natural products of the country, however, have been sufficiently varied to provide for all the legitimate wants of a large and self-respecting population. With the advent of modern science and political stability, one can easily foresee an immense development of internal resources, and such an enlarged use of forces now going to waste, that the whole aspect of the country will be transformed in the course of two or three generations.

Improvements in Transportation

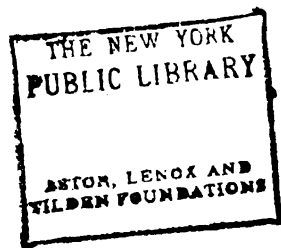
It is hardly possible to overestimate the waste of power expended in the traditional mode of transportation throughout all Central Asia. The camel and the horse consume for transportation the food that otherwise would sustain herds of cattle and flocks of sheep which provide sustenance and clothing and

shelter for a nomadic people, and furnish them with means of valuable commercial exchange. As it is, these millions of beasts of burden are wasting both the natural forces stored up in their own muscles and the lives of an innumerable number of attendants in doing what the direct forces of nature could accomplish without consuming the natural resources, upon which all are dependent for their very life.

The Transcaspian railroad has already displaced the long camel trains between the Caspian Sea and Tashkent, while the fires of their engines are fed by crude petroleum, which is now, for the most part, brought from Baku, but which will doubtless in due time be obtained in large quantities in many other places. Indeed, Alexander the Great "struck oil" in the vicinity of Samarkand 2,200 years ago; but, as oil was not what he then most wanted, and its value was not recognized, the incident has simply come down to us as an incredible story of early legendary history. It is, however, related in all the standard histories, that, when suffering from a lack of water in the desert near Samarkand, he ordered a well to be sunk in the sand, and finding oil at the bottom of it instead of water, he turned away in disgust. Thus narrowly did he escape being the Oil King of Asia rather than the conqueror of India. In recent years the indications of petroleum which have been found in various portions of Turkestan are such as justly to warrant great expectations for the future. Coal, also, is found in abundance in the mountains east of Samarkand and Kokand, and all along the base of the mountains extending from Tashkent to Chimkent, and Auleata; also farther east, in the vicinity



Burning Oil-Well at Baku.



of Kuldja, about the headwaters of the Chu. Doubtless, also, it exists in great quantities throughout much of the intervening unexplored region.

Iron, also, is found throughout the entire district in close proximity to the coal. So that the future traveler will not be likely to meet, as he now does in this region, long caravans of camels carrying iron upon their backs 500 miles from any line of steam transportation. The country itself is able from its own resources to supply all these coarser necessities of advanced civilization.

At the present time the termination of the Transcaspian Railroad is at Tashkent, but there is every reason for it to extend along the whole length of the thickly settled irrigated border to Semipalatinsk, on the Irtysh River, a distance of one thousand two hundred miles, where it would meet the vast internal system of water communication connected with the Irtysh River. More likely, however, it will be extended farther on, around the border of the Altai Mountains; through Barnaul and Kusnetsk, to join the main Trans-Siberian line at Mariinsk or Achinsk, on the watershed between the Chu and the Yenisei about one hundred miles west of Krasnoyarsk. Another line of railroad very likely soon to be demanded would extend from Tashkent down the valley of the Syr Daria to the north end of the Aral Sea, and thence along the old caravan route to Orenburg, a distance of about one thousand miles, where it would be directly connected with the great railroad system of European Russia.

All this is along lines already projected for the accommoda-

tion of internal commerce. At the same time an outlet to the external world already provided for in treaties between Russia and Persia will reach the Persian Gulf somewhere near Benderabas. Indeed, the Russian end of this line has been for some time completed from Merv to the border of Afghanistan near Herat, a distance of about 250 miles. An extension of 700 or 800 miles would carry this road through some of the most populous portions of Afghanistan and Persia to a commodious harbor upon the Persian Gulf, where an easy exchange of the more valuable products could be made with the rest of the world.

Importance of Home Manufactures

But it is not to foreign commerce that we are to look for the promotion of the largest interests in Siberia. This is rather to be found in the development of her own rich resources which so abundantly fit her to maintain an independent civilization. What Siberia needs, and is in the way of speedily securing, is the enlargement of her internal commerce through the development of her mines and manufactories and the utilization of her forests and her water-power. Her agriculturalists most of all need a home market where the profits will not be all absorbed in transportation of coarse material. For the securing of this she has every facility at hand. Her coal deposits throughout much of the steppe region of Akmolinsk and Semipalatinsk, and in the provinces of Tomsk, Irkutsk, Transbaikalia, and in the lower part of the valley of the Amur, as well as in the vicinity of Vladivostok and the Island of Sak-

halin, are sufficient to supply the wants of a great nation for a long time to come; while iron abounds in close proximity in the Altai Mountains near Minusinsk, and in the provinces of Irkutsk and Transbaikalia. Even though the production of iron and other manufactured products necessarily should be more expensive than in the more favored localities in other parts of the world, the advantage to the agriculturalist of having a market near at hand where he can save the cost of long transportation, would be the difference between comfort and penury

As already suggested with reference to Siberia, a possible, and in view of recent scientific developments a by no means improbable, source of power for a large part of these railroad lines, and for other industries, is the electricity which can easily be developed from the innumerable waterfalls of the region. Through the entire length of the Transcaspian line and its suggested projection to Central Siberia, it runs near the base of one of the loftiest mountain chains in the world. Through much of this way glacier-clad summits provide the perennial streams which serve for irrigation, and in that service transform the margin of the desert into a blooming garden. But in the descent of these streams from the summits of the Hindu Kush, the Alai Tagh, the Tian-Shan, the Ala-tau, and the Altai ranges, and from the high plateaus of Afghanistan and the Pamir, there now must be waste power enough to meet the needs both of the transportation of the entire country, and of its manufacturing interests.

Or, if the power now wasted in the water which is permitted

to descend from these lofty summits to the plains without use, is not sufficient for both these purposes, there is at hand through all Central Asia the unlimited resource of the fierce direct rays of sunlight reaching the earth through a cloudless sky. Here in sight of the grand scenery of glacier-clad mountains, and amid the rich verdure of irrigated fields where there is everything that the earth produces to supply the bodily wants of man, Ericsson with his perfected machines for transforming the direct heat of the sun into mechanical action would have had his source of power almost always available. In Bokhara and Samarkand, one half the days in the year are cloudless, while only sixty days in the year are sufficiently clouded materially to shield the earth from the sun's heat.

Trans-Caucasia has been so long the meeting-place for the most enterprising races of the world, and has had such ready means of communicating with outside nations through the Caspian and the Black seas, that it has more nearly reached the limit of its development, having, in its 94,000 square miles of territory, a population of more than five and one half millions, averaging sixty-four to the square mile, or nearly twice that of the northern central division of the United States and three times that of the United States considered as a whole. When we consider that much of this territory lies in the mountainous districts of the Caucasus and of Armenia, it would seem that the limit of population had been nearly reached. Nevertheless, it is true that a large portion of the lower valley of the Kur remains a desert because of a deficiency of rainfall and the lack of a comprehensive system of irrigation; while

CAPACITY FOR DEVELOPMENT 453

the mineral resources of the mountain regions are far from being developed to their full extent. Under stable government and the wise application of modern improvements there is still large opportunity for an increasing population to find comfortable subsistence and profitable means of employment.

Looking at Asiatic Russia as a whole and with its present limits, it is therefore easily within the bounds of possibility, and even of probability, to expect that before the close of the twentieth century it will have a population of 100,000,000, provided a stable government can be maintained and peace be permitted to reign, so that man shall be unhindered in his efforts to perfect his conquests over the powers of nature. With this vision before him it is not surprising that the Tsar should long for peace, nor that he should be almost alone in this desire; for, more than any other country in the world, Russia is in position to obtain the main objects of national ambition through the next one hundred years by turning attention to the development of the internal resources of her own empire. Apparently there are operating within her body politic all the forces which, if wisely guided, will secure the highest objects of national ambition, namely, a steady increase of population, accompanied by a corresponding increase in the material supplies necessary for the comfort of the people, and for that association with one another and contact with the outer world which is necessary to foster the highest social and intellectual progress.

XXIV

GROUND FOR CONFIDENCE IN THE FUTURE

IN considering the possibility that the foregoing ideal shall be even approximately realized, we shall find that the forces already in operation seem sufficient and the conditions peculiarly favorable for its attainment.

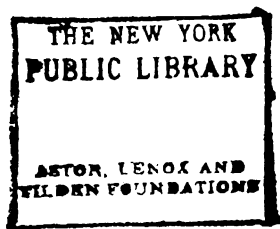
Siberia for the Russians

First, it augurs well for the Siberian part of Russia that it is not open to indiscriminate immigration, but that it has been reserved for the natural increase of the indigenous population and for Russia emigrants. In this way a unity can be preserved that would not otherwise be possible. Nor will there be, on this account, any great delay in the occupation of the country. With the present birth-rate continuing as it does in Russia and among the Russian settlers in Siberia, the growth of the country will be as rapid as any one could reasonably wish.

In many respects the conditions are the same as those which prevailed in the United States during the first half of the nineteenth century, when there was scarcely any immigration, but



Market Day at Irkutsk.



the increase was almost wholly due to the high birth-rate prevailing among the English settlers already in the country. From this source alone, the population continued to double every twenty or twenty-one years, the per cent of annual increase in each decennial period averaging 3.30. Whereas in 1800 there were 5,308,483, in 1850 there were 23,191,876. But from that time on, notwithstanding the immense immigration, the rate of increase has diminished; so that, at the end of the nineteenth century the population is only 75,620,859. In other words, the natural increase during the first half of the century was more than fourfold; while the total increase during the last half of the century, including the enormous immigration, was only a little over threefold.

It is therefore entirely possible for Siberia alone, at the end of the twentieth century, to have a homogeneous population larger than the United States possessed at the end of the nineteenth century. The "sum of being" in Siberia may be as great if it is kept exclusively for the Russians as it would be if, like the United States, the doors were flung wide open for immigration from all parts of the world with the introduction of the diverse elements of thought and social life which that implies.

Cheapness of Travel

Secondly, the Siberian settlers at the beginning of the twentieth century have at their command all the resources for maintaining unity and securing development which modern science can furnish. Through the advent of steamboats upon

her rivers, the towns along twenty-seven thousand miles of navigable rivers are all brought within easy communication with each other; while the construction of one or two short canals, and of a few locks to avoid rapids in the upper portion of some of the larger rivers, will greatly increase even this immense extent of internal river navigation. The completion of the railroad system already planned and largely constructed, combined with the low rates of passenger tariff secured by the "zone system," brings the population even of the most distant parts within easy reach of the main centers of civilization. By this system, the diminution of rates is such that long distances can be covered at very little cost. While first-class rates, for instance, which secure sleeping accommodations, are 2.9 cents per mile for short distances, they are only 2.25 cents for distances of from 200 to 300 miles, 1.75 for 500 miles, 1.33 for 1,000 miles, 1.06 for 2,000 miles, .96 for 3,000, and .9 for 5,000. The second-class rates, which also provide for sleeping accommodations, range from 1.8 cents for short distances, to 1.33 for 200 miles, 1.25 for 300, 1.20 for 500, and so on down to .54 for 4,000; while the third-class range from 1.1 cents per mile for the short distances down to .36 for long distances; and the fourth class, which provide box cars in which whole families can ride with their goods in measurable comfort, are at even lower rates. At the same time the cost of living is brought down to the lowest point to travelers by the provisions which are made for securing food at all prominent stations; boiling water, as already said, being provided without cost, so that their tea and soup can be made as cheaply as at home.

Owing to these cheap rates, one is surprised at the vast amount of travel in every direction along the Siberian roads; while the steamboats which intersect the railroad at various points carry passengers of all grades at still lower rates. All this is a very important element in maintaining the unity of feeling which characterizes the Siberian settlements.

The Postal System

Thirdly, the postal system of Siberia has long been a model to the rest of the world. In the early part of the eighteenth century, all the principal settlements from the Ural Mountains to the Pacific Ocean were connected by postal routes over which the distances were carefully measured. Where it was possible, these routes were broad wagon-roads, twenty-one feet wide, over which officials, travelers, and immigrants could be transported at the most rapid possible speed for horses, and at very moderate rates. From the earliest time the charge for post-horses in Western Siberia was only a cent and a half or two cents a mile, while that in Scotland at the same time was five cents a mile. Even at that early period, letters were carried for distances of 1,500 miles for a tariff of only nine cents, and 4,000 miles, namely from Moscow to Nerchinsk, for twenty cents, while in England at the same time the charge for short distances on the island was twenty-eight cents, and in France, twenty-five cents for 600 miles. Even in the United States, as late as 1846, ten cents was charged upon letters going over 300 miles. A half a century before cheap postage was inaugurated in England, it was in full operation throughout the Russian

Empire, in recognition of the fact that the primary object of the postal service is not to obtain revenue for the government, but to facilitate communication between the people, and furnish means for the cementing of friendships between those who are separated by long distances.

Nor has the Russian government been behind others in the promptness and frequency with which its mails have been conveyed. As early as 1731 a fortnightly mail was established between Tobolsk and Moscow, a distance of 1,200 miles, while in 1702 mails between New York and Boston were carried only once in two weeks, though the distance is but 250 miles. In 1784 the mail carriers of England traveled at a rate of three miles and a half an hour, while in Siberia it was, for a considerable part of the route, from eight to ten miles an hour, 200 miles a day being no uncommon speed. At the present time the mail service of the Asiatic provinces of Russia, taking advantage of the railroad, is as good as any in the world, bringing the people of the most distant cities and provinces into close connection with one another ; while the telegraph is everywhere present ; so that the entire nation throbs daily with the same emotions as those which hold sway in all the larger centers of thought and activity.

Religious Unity

Fourthly, the religious sentiments of the people furnish, perhaps, the most important basis for preserving the bond of national unity. There is not, however, as is often supposed, an iron-clad uniformity in religious belief throughout the

Russian Empire. In many respects Russia is the most tolerant of all governments. As already said, all established religious bodies are recognized and are permitted to exercise their rights with great freedom. While the orthodox Greek Church is the established religion of the empire, there are within its bounds, and under the protection of its laws, more than 12,000,000 Roman Catholics, nearly 7,000,000 Protestants, more than 4,000,000 Jews, more than 1,000,000 Armenians, more than 12,000,000 Mohammedans, and 3,000,000 of other recognized religious adherents.

It is true that there are probably nearly 15,000,000 of native Russian dissenters from the established church, of whom an unusually large percentage are in Siberia. But with few exceptions their dissent is not upon fundamental points. For the most part, the dissenters, like the regular adherents of the church, strenuously hold to the doctrines of Christianity as formulated by the first seven ecumenical councils which were held before the separation between the Eastern and Western churches took place. And, like the Orthodox Church, the dissenters maintain their profound respect for the Bible, promoting its circulation, and going to it directly for the settlement of disputed points. In this respect the position is curiously similar to that in the United States, where, with the greatest diversity of sects, each appealing to the Bible, there is a remarkable and substantial unity in the main elements of Christian life, and of the central doctrines which are promoted.

Some would represent that the religion of the Russians, and especially that of the Russian settlers in Siberia, as so forma

that it cannot be sincere, and so overlaid with meaningless rites and ceremonies that it can scarcely be distinguished from the lowest forms of heathen superstition. This, however, is most certainly a mistaken view of the case; for, however much inferior to the freer methods of Protestantism, these ritual services may be for the dissemination of Christian truth and the production of genuine Christian activity and emotion, one cannot mingle much with the people without seeing that, to a large and encouraging degree, these means are effective in accomplishing the true aims of Christian culture. The traveler in Siberia, from whatever Christian land he may come, can but recognize that all classes of Russian people are moved, in the main, by the high standards of Christian thought and action.

The churches before which the peasant pauses to cross himself are symbols to him of the purest and noblest human life that ever was lived upon the earth. When once within the doors, one finds the rich and the poor, the educated and the ignorant, the high official and the subaltern, those who have been successful in life and those who have been cast down in the deepest sorrow, joining in common acts of adoration, subdued by the same deep, sweet, musical harmonies in which the noblest religious creed in the world is floated out upon the worshippers and made to flood their senses with suitable emotion. He sees the horny handed peasant with shaggy beard and careworn countenance, and the plainly dressed woman bowed beneath the cares of some large household whose interest she has served for scores of years, together with the

gayly uniformed officer and the youthful Cossack, each full of tender memories of the home and village far away, from which now for a time he is separated by the stern duties of war; all these, and many more, one sees pressing up, at appropriate intervals, toward the painting of Christ upon the wall, to kiss the feet of that Master whose standard of duty was the purest, the noblest and the highest ever presented to the world, and yet who looked with streaming eyes of compassion upon the guilty, and forgave to the uttermost all who came to Him.

It is idle to say that the central thoughts of the Christian religion do not shine through these forms of expression and penetrate the peasant mind. The sorrows and mysteries of human life weigh too heavily upon the peasant's soul for him to be indifferent to the significance of the eternal truths which in a thousand ways are embodied in the ordinances and ceremonials of his church service, and indeed of the whole Christian civilization which surrounds him. The mysteries of a soul's entrance into life are recognized by the church in the birth of every infant, in the marriage of every loving pair, in the solemn hours of every death and burial; while the maimed, the halt, and the blind gather about the church doors, and in silence appeal for that compassionate consideration which is granted to such nowhere but in Christian lands; and they are not repulsed, but their claims are generously recognized by all.

In short, nothing is more democratic than a Russian church service, where all classes gather, where there are no seats, but where all stand in reverence and listen to the reading of the Bible, to the chanting of the service and the creed, and where

all occasionally join in the responses, and recognize by appropriate genuflections and gestures the most impressive and the most important parts of the ritual. That all this fails to make them perfect as they go out into the perplexing whirl of the cares of daily life is no more than can be said of every other means of making human nature perfect. But that it does make a profound impression, and diffuse throughout the entire body politic that indescribable element of our civilization which we call Christian, no sympathetic traveler in Siberia can for a moment doubt.

In the existence of this high standard of political, social, and private morality, and in its general acceptance by the people, the Russian Empire has a great vantage-ground in permanently developing and controlling its Asiatic possessions. It would be easy, from a Protestant point of view, to criticize the methods employed by the Russian Church for the enlightenment of the people. But such criticism would lose much of its value, in view of the difficulty the distant observer has of understanding the conditions of the problem before him. Nothing is harder than for a foreigner to get an adequate comprehension of the social and religious history of the Russian people. But nothing is clearer than that the nation is remarkably imbued with the noblest Christian sentiments, and is continually in ferment by reason of its lofty Christian aspirations. The emancipation of the serfs is probably the most stupendous single Christian act which the world has ever witnessed. The abolition of capital punishment in the eighteenth century, however great a mistake it may have been, nevertheless, without doubt, was a

result of the strength of the universal Christian sentiment of the nation.

If the state now feels bound to support the church, it has good excuse to do so in recognition of the fact, that, over and over again, it is the church which has saved the state, by emphasizing the national unity and opposing the encroachments of alien faiths. If there has been, and still is, too great rigidity on the part of the church in limiting the freedom of thought and speculation among its members, this is a matter which can well be left for gradual amelioration through that interchange of thought among the enlightened Christian leaders which is going on now more rapidly than ever.

Political and Judicial Factors

So far as its future is affected by governmental conditions, Asiatic Russia must share in the general fortunes of the empire, which are exceedingly difficult to forecast. The Russian government has the reputation of being the most autocratic in the world. But this statement is to be taken with various important reservations; for even the most autocratic government necessarily has some sort of an unwritten constitution, and is compelled to give attention to the prevailing public sentiment of the nation. On the other hand, the most democratic form of government finds itself helpless without some centralization of power, which amounts in substance to autocracy.

In estimating the advantages and disadvantages of any form of government it is a great mistake to assume that a bad form will be as bad in its results as it can be, or a good form as good

as it is possible to be. There are innumerable deep-seated elements in human nature which interfere with the success of theoretically the best governments, and others which restrain the evils supposed to be inevitable in a bad system. Thus it may well be that an upholder of the republican system in America may look with much complacency and hope upon the future of an autocratic government such as exists in Russia.

Popular Elements Retained

For, as previously noted, the Russian people still retain much of the democratic freedom which early characterized their history, and which, in its unlimited form, long checked the development of the nation, and by reason of its divisions nearly caused the ruin of the empire. Forming at first merely an incoherent agglomeration of petty republics, the people were slow to combine into a unity sufficiently compact to resist the aggression of outside powers, especially those pressing upon them from Asia. The centralization of Russia was forced upon her by the encroachments of her Tartar foes.

But, in securing the present unity, a large amount of autonomy has still been left to the local communes, to the Cossack "Stanitzas," to the church, and to all established religious organizations. There is in Russia properly no aristocracy. High-sounding titles abound, but there is no law of primogeniture to keep estates together. A prince may be a very common person and very poor. The authority of the Tsar rests directly upon the people. The government at St. Petersburg recognizes the

village commune as the political unit, and deals with it without the intervention of aristocratic agencies. This, of course, necessitates an immense bureaucracy, with all the incidental evils connected with it. The chief of these arise from the excessive multiplication of details of administration, under which the system becomes so cumbrous that it is rendered ineffective.

Organs of the Central Government

The Tsar has no prime minister. He is, indeed, advised by a Council of State, whose constitution is somewhat like that of the Lords of England, and he has ten Ministries, or "Portfolios," somewhat resembling the departments represented by the Cabinet at Washington. These are: 1st, the Emperor's Household (the Court properly so called); 2d, Foreign Affairs; 3d, the Interior; 4th, Finances; 5th, Justice; 6th, Public Instruction; 7th, Communication; 8th, Crown Demesnes; 9th, War; 10th, Navy.

But these ministries, usually composed of the ablest men of the empire, have no way of bringing their concerted influence to bear upon questions of public policy. In his isolation each is naturally intent upon his own affairs, and each brings his plan independently before the supreme authority. In this independence of the departments there lies an important protection to the interests of the people. Throughout the entire empire are scattered officials who, through their relations to the several ministries, are independent of each other. The military agent in Shang-hai or Tientsin, for example, reports di-

rectly to the Minister of War, in St. Petersburg, being entirely independent of the Ambassador in China, who represents another department.

The Tsar is sometimes represented to be the head of the Russian Church, because he nominates the members of the Holy Synod, but he does this under certain well-known restrictions. An unwritten but imperative law compels him to select these members from a certain order of the clergy, while he himself is not permitted to change his religion, but recognizes everywhere that he is under the Church, and not over it. He cannot be the Tsar, except he confesses the "Orthodox faith," nor does the Tsar have any choice as to his successor, who can no longer be a woman, but must be in the male line as fixed by a regular order. But alien religions are, on the other hand, recognized and in general given perfect liberty so long as they remain loyal to the existing political organization and do not engage in proselyting.

Labor Organizations

Side by side with the village commune there is the equally peculiar Russian institution known as the *artel*. This is a co-operative organization of laborers which undertakes the accomplishment of any piece of work or industrial enterprise, and divides the profits among the members. It rarely consists of more than fifteen members, but more usually of five or six, and is not permanently bound together, but is organized for the specific work in hand. One of their own number is elected as their representative, and makes contracts for them, but has no more

interest than the other members in the profits. So universally are these artels distributed over the empire, that contracts for labor are rarely ever made with individual workmen.

The working of this unique institution is strikingly illustrated in the fishing industries upon the Ural River, which are carried on by a combination of artels sustaining somewhat the same relation to the fishing rights and privileges that the village communes do to the landed interests. Altogether upon the lower course of the Ural and the adjoining portions of the Caspian Sea about twenty thousand men are associated in local artels united into a vast "fishing army," which acts together for the mutual interests of its members. To protect the rights of all, it is necessary that the fishing along the whole line should begin at the same time. Precise regulations are therefore laid down for the conduct of all the artels, or small companies, of fishermen, and all begin at the firing of a signal gun.

But the division of profits is limited to the members of each company of from ten to fifteen. This, however, is as far as the communism goes. When each individual receives his share of profit, it is his own to spend or to save. The saving ones may accumulate property, and in joining future artels make profitable bargains for themselves by furnishing nets and equipment and getting a proportionate amount of the profits; while in other cases the skill or knowledge of an expert fisherman may become a valuable asset from which he may obtain a larger proportionate amount of the profits.

All these, and various other, national characteristics and institutions have to be taken into account by the autocratic govern-

ment, and, like the Gulf Stream in the ocean, they guide the ship of state more than they are guided by it. Peter the Great was not much of a Christian, but he could not effect any radical changes in the organization of the Church, and he nearly split the empire in his effort to compel the people to shave off their beards. The millions of "Raskolniks" of the present day who refuse to shave their beards are witnesses to the persistency of democratic and religious national characteristics. A fine of a hundred rubles had little effect in compelling these dissenters to shave off their beards contrary to what they believed to be the command of Scripture.

Representative Institutions

In addition to this universal recognition of various laws of church and state, both written and unwritten, and of the village commune and the workman's artel, much progress has been made in the last half-century toward giving the advantages of representative government to the smaller divisions of the empire. In accordance with plans which originated with Alexander II., the village communes have been combined into larger organizations called *volosts*, which elect elders and small tribunals for the settlement of a certain class of civil and criminal cases; while a number of *volosts* are combined into a larger district which elects a provincial assembly known as the *zemstvo*.

The *volosts* also elect justices of a higher order, which form a court to hear appeals from the decisions of individual justices.

The *zemstvos* largely regulate taxation and expenditures for

education, roads, etc., though first of all they must provide for the tax levied by the state. The assemblies, however, are subject to supervision by the state authorities somewhat as in the United States all the acts of city councils and state legislatures or decisions of state courts can be taken by appeal to the United States courts, the members of which are not elected by the people, but are appointed for life by the President and Senate.

But it must be said that in Russia the general government is represented in all the provinces by a governor appointed by the central authorities, and by a council whose members are also appointed, and so not directly responsible to the people. There is also a widely scattered body of secret police called into special prominence to ferret out the anarchistic plots which have been so numerous in all parts of Europe and the United States. Technically the secret police is justified under the plea that the anarchists have made it necessary to place the whole empire in "a state of siege." It is this class of police which has secured the arrest and banishment of the so-called political exiles, whose fate has aroused so much sympathy throughout the Western world. But, except in special epochs, the number of political arrests has not been large, and the secret service does not differ essentially in its character from agencies which are resorted to in emergencies by every form of government. The secret police find analogies in the United States in the agents who execute the martial law which is occasionally proclaimed by the President, and in the secret emissaries of the post-office department who are continually on the watch to intercept the transmission of prohibited literature.

The judicial system of Russia is now largely based upon the "Code Napoleon," though the jury system has been appended, and many supposed improvements adopted. Under this system, all minor cases are referred to justices of the peace, who are elected by the people, but all serious criminal cases are tried by juries, from whose verdicts an appeal can be made to the higher courts, which are also elective. Political offenses, however, are tried by special tribunals. With this possible exception the judicial system and both the civil and criminal codes of Russia are among the most enlightened in Europe, and every reasonable effort is made to detect their weaknesses and remedy their faults.

Unification of the Empire

The extension of the entire governmental system of European Russia over Siberia is merely a question of time. Already Trans-Caucasia, Tobolsk, and Tomsk have independent governors, and are put on an equality with the European provinces, while Yeniseisk, Irkutsk, Yakutsk, and Transbaikalia are under the control of the governor-general of East Siberia, residing at Irkutsk; and Amur and the Maritime Province are under a governor-general residing at Khabarovsk. The region of the Steppes, including Uralsk, Turgai, Akmolinsk, Semirechensk, and Semipalatinsk, have a governor-general stationed at Omsk; while Turkestan with all its provinces has one at Tashkent.

Independent of these governor-generals, there are military governors (individually responsible to the Minister of War) over Uralsk, the Trans-Caspian region, Turgai, Samarkand,

Syr Daria, Ferghana, Semipalatinsk, Semirechensk, Akmo-
linsk, Transbaikalia, Amur, the Maritime Province, and Sak-
halin, with local civil governors over Yeniseisk, Irkutsk, and
Yakutsk. All these hold their offices by appointment from the
central government, and are aided by a council composed of
the chiefs of departments of their own appointment and inde-
pendent officials stationed at the various centers by the minis-
tries at St. Petersburg and responsible directly to them.

The condition of things is slightly analogous to that in the
United States in whose territories the governors and some other
officials are appointed at Washington. It is true that in the
regularly organized territories of the United States there is an
elective assembly having limited power, but in Alaska and in
the more recent territorial acquisition there are no elective as-
semblies, but the entire machinery of government is conducted
by officials who receive their appointment from Washington.
In Asiatic Russia the great predominance of Russian popula-
tion will render it comparatively easy to extend the provisions
of European Russia over the entire region, and with present
means of communication there would seem to be no reason why
the unity of the empire could not be preserved with any amount
of increase in the population.

XXV

FOREIGN RELATIONS

IF, in addition to this summary of facts relating to Russia's expansion in Asia, one takes a brief glance at the map, he will easily see the baselessness of the fears that are felt in Europe, especially in England, lest Russia is to absorb all Asia and become the autocrat of the world. It will be observed that Russia's expansion has been chiefly toward the east into thinly settled countries where the conflict was more with nature than with man, and that it has been between parallels of latitude where the conditions of life are closely similar to those in the home land. A study of the history of the occupation which has so far taken place shows, also, that the territory acquired has been obtained by much less war and bloodshed than is usually the case in territorial conquests.

Expansion in Asia Logical and Natural

After the first sharp contest of Yermak with the Tartars of the Tobol, there was little occasion for warfare until reaching Central Siberia, when the Buriats and others put up a vigorous opposition for a while, but soon were able to live side by side with their conquerors in peace and mutual respect. In some

of the northeastern portions, especially among the Koriaks, there were scenes of indescribable bloodshed and horror; but when these are compared with those connected with the occupation by other nations, of the United States, of Africa, and of India, they seem relatively insignificant; while the possession of the entire valley of the Amur and the Usuri was obtained from China by a peaceable treaty won by the persistence of Muravieff in a policy that was continually discouraged by the ministry at St. Petersburg.

At the same time, possession of Transcaucasia was obtained by the abdication of the King of Georgia in favor of the Tsar, because, under the pressure of the Mohammedan powers, he was unable to maintain his independence. The conquest of the entire Caucasus came as a natural and necessary result from this heritage. The occupation of Turkestan has, also, come about largely through the voluntary submission of the Kirghiz Tartars when they needed the aid of Russia to protect them against the violence of their Usbeg and Turkoman neighbors. The advance of Russia to the mountain border of the great central Asiatic Plateau therefore became necessary both for the protection of her own citizens and for the general preservation of peace.

The occupation of Manchuria, likewise, has come about through natural causes which were imperative, and which need not endanger the relations of the empire to other nations. The general good required that the increasing population in Eastern Siberia should have ready access to a port upon the Pacific Ocean. This China granted to the Russians by the treaty of

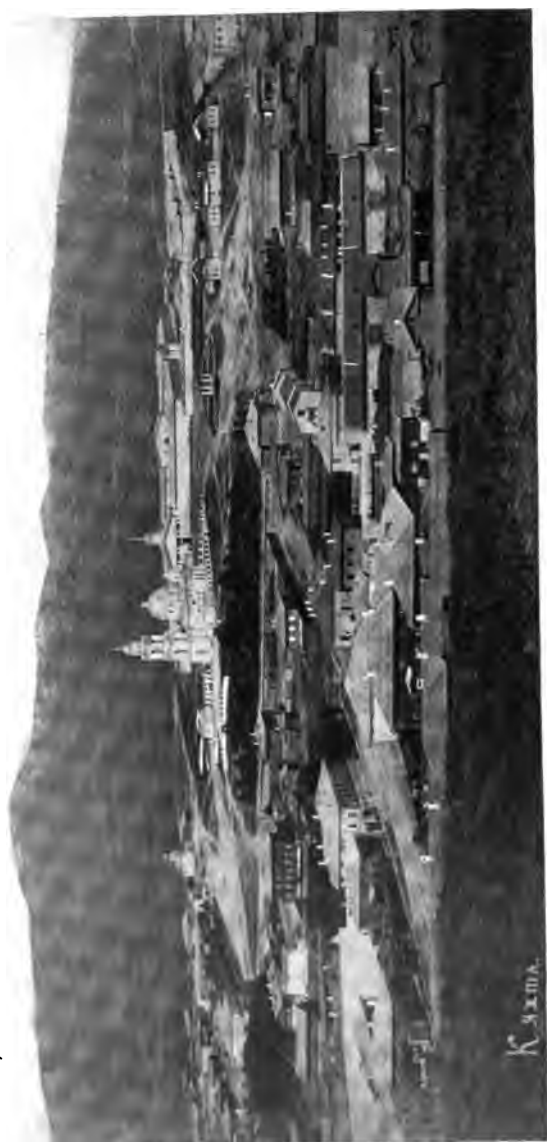
Peking, permitting the building of the Chinese Eastern railway to connect Siberia with Vladivostok and Port Arthur. Unfortunately the revolution in China of 1900 led to the violation of these treaty rights on the part of the Chinese, who allowed, and even commanded, their troops to destroy the very property which they had pledged themselves to protect, and made it necessary for the Russians to resort to temporary military occupation. If, as seems probable, the Chinese shall be so slow in recovering themselves that Russia shall have to retain the country permanently under her protection, even that will not be a calamity of great magnitude to the rest of the world; while it would probably be of as great advantage to Manchuria itself (which is but thinly settled) as the occupation of Turkestan has been to that fertile but disorganized region.

Additional Railroads Needed

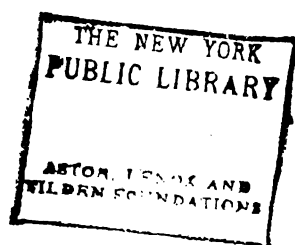
Nor is the railroad across Manchuria the only one which the interests of mankind demand in that region. A saving of about 900 miles for the commerce between Siberia and China would be effected by a railroad extending from Kiakhta across the Mongolian Desert to Peking on the seacoast by way of Kalgan. This has long been the favorite caravan route between China and Russia, and presents no serious engineering difficulties. As far as Urga, the country is fertile and well-watered and capable of sustaining a much larger population than is possible under the present nomadic conditions; while even across the so-called Desert of Gobi, there is everywhere sufficient pasturage for camels and horses, and wells are more

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frequent than they are in many places in the Transcaspian region. At Kalgan the railroad would reach the most important point of traffic and commerce in Northwestern China.

A glance at the map will also show that the Russian possessions in Central Asia are likewise in great need of direct railroad connection across Persia to the Indian Ocean. There can be no question that the general good requires that such a vast and growing population as there is in Turkestan should have free access for its surplus products to the markets of the world. If the interests of the United States demand a canal across the Isthmus of Panama, much more is Asiatic Russia in need of free channels of communication with the whole outside world. But it is not likely, if we judge the future by the past, that the opening of these lines of traffic will lead to extensive Russian colonization or military occupation.

The Russian colonist has not heretofore readily entered into competition with those who were in actual occupation of their own country. The Russian emigrant finds himself most at home when called upon to subdue the wild forces of nature, and has never ventured where he would become a close competitor of densely populated regions. Nothing would be more out of its element than a Russian colonist in India, or a Russian agriculturist in China. As it is, the Siberian peasant is jealous of the new emigrants from his own country who are restricting by their presence the free occupation of waste land to which the pioneers were accustomed. Much less could the Russian peasant with his habits of agriculture, compete side by side with the agricultural methods of the Chinese.

Irrepressible Factors in the Eastern Question

And this brings us face to face with the great problem of the Orient, and the irrepressible conflict already beginning there, which is to tax to the utmost the wisdom of the statesmen of three great nations. In China the Russian glacier meets an obstacle similar to that which confronts it on its western border. Russia's expansion toward the east has been largely due to the fact that there was no room to expand on the west, since that territory was fully occupied by a dense and well-organized population. In China she meets a still more dense, though less thoroughly organized population; so that in the advance of Russia in that direction we seem to have a repetition of the old problem concerning the results which would follow when an irresistible meets an immovable.

To be sure there is in Manchuria, and to some extent in Mongolia, much land still to be possessed, but not enough to postpone the conflict for any great length of time. China is irresistible by reason both of her vast numbers and of the frugality, industry, and remarkable virility of her people. The Chinese cannot be displaced by immigrants, as the inhabitants of the thinly populated and barbarous regions of Siberia, America, and Africa have been. Indeed, all bordering nations are taxed to the utmost to prevent being overwhelmed by Chinese emigrants who are seeking relief from the crowded conditions and sharp competition which everywhere prevail in the Celestial Empire. In the very nature of things, China must be for the Chinese, and Russia must adjust herself to live, in the future, side by side with a powerful nation bounding her upon the southeast,

as she now lives side by side with the powerful nations of Central Europe.

With Japan, also, will she be compelled to make permanent terms of peace. With this enterprising island empire controlling the sea and compelled by the rapid increase of her population and the limitations of her own territory to seek foreign trade and colonial expansion, the competition between the two countries must be sharp in the extreme; while the hazard of international complications will always be imminent. Indeed, when one reflects upon the capacity of these three great nations to increase in population to twice their present number by the middle of the century, and to four times the number at the close of the century, it is enough to make him stand aghast at the difficulty and the imperiousness of the problem which confronts their statesmen.

It were in vain to hope that in this case more than in the case of other nations in other periods of history, Russia, China, and Japan should each be as much interested in the welfare of others as she is in her own. All that can be hoped is that each nation shall follow a policy of enlightened self-interest, which would certainly lead each to be strong in its own defense, so that it shall not invite by its weakness attack from foreign powers; and further than this to develop to the utmost the resources peculiar to each country, and to encourage those religious and social ideas and conditions, which shall secure the high development of the individual units of society rather than the mere multiplication of numbers. Under the present social conditions in China in which every woman is expected to marry

at a very early age, infanticide, pestilence, and famine are the only relief to the overcrowded population, except it be in emigration, and this is being more and more curtailed by the restrictive legislation of other countries. To be sure, the development of the mines of the empire may to some extent enlarge her capacity to support the increasing population, and thus defer the catastrophe for a brief period; but it is scarcely possible for China greatly to increase her agricultural products.

A somewhat similar story is to be told concerning Japan, where there is already a population of about 3,000 to every square mile of arable land on the main island of the empire with but little opportunity for extending the area of cultivation in the northern island, or for promoting emigration to Formosa or to any other territory of which she may obtain possession. To a considerable extent Japan is burdened with the same social conditions as those which are weighing down China. There, as in China, early marriages are regarded as almost essential, but the prevalence of Christian ideas is checking infanticide, and the progress of sanitary science and medical skill is banishing pestilence and prolonging the average of human life, so that the pressure of population is even greater than it was under former conditions. Whether there will be in the empire the complete triumph of the pure ideals in family life which characterize the more advanced Christian communities, before the forces now in operation shall end in their natural catastrophe, and plunge the statesmen of Japan into some ill-considered form of war, or provoke some still more fatal internal conflict, is yet to be seen.

The Armenian Border

It remains to speak of the condition existing on the southwestern border of Asiatic Russia where the Transcaucasian Province joins upon Persia and Turkey, and where some of the most recent additions have been made to the Russian territory. The conditions here are peculiar on account of the religious complications. For a long time the adherents of the Greek Church in southeastern Europe and in Asia Minor together with the allied Armenian and Georgian Churches have looked to Russia for protection against the encroachments of Mohammedan powers. As we have already seen, in the beginning of the nineteenth century the Georgian Christians in Transcaucasia sought and secured the protection of Russia from the encroachments of the Mohammedan power in Persia. At a later period Armenians to the number of one million have been incorporated into the Russian Empire, being allowed to maintain their independent church organization. After the war with Turkey in 1877, the Russian lines were extended to a considerable distance farther south on the Armenian Plateau until it now reaches Mt. Ararat and includes the important military center of Kars. But there is here only an artificial boundary line.

Naturally the Armenians in northern Persia and in the eastern part of Turkey in Asia together with their numerous Greek and Nestorian co-religionists would be glad to be freed from their anomalous position as subjects of Mohammedan powers; and Russia, by virtue both of religious faith and geographical

position, is the natural power to which they would look for relief and protection.

The jealousies of Europe, however, prevent Russia from taking active steps towards affording this protection. By the Crimean War she was temporarily dethroned from her oldtime position as the protector of Christians in the East, while the normal results of the war with Turkey in 1877 and 1878 were not allowed to accrue largely to her benefit. But at the present time the relations all along the southwestern border of Trans-Caucasia are in a very strained condition. In times past Armenians in great numbers have crossed from Turkish to Russian territory, where they could find freer scope for their religious development. But recently the relations of the governments have become such that Russia is compelled to discourage to the utmost this immigration, and Turkey has interposed all possible difficulties in the way of emigration. To such an extent have these jealousies increased that there are now large numbers of Armenians in Russia whose families are still in Turkey, and they cannot get permission either to go back and join their families in Asia Minor or to have their families come to join them in Russia.

The question of the extension of Russian territory into Asia Minor is therefore the whole "eastern question" in a nutshell, which relates to that of the persistence of the Turkish Empire and to the adjustment of the European balance of power as affected by the possession of the ancient centers of civilization about the Ægean Sea and the Bosphorus. Naturally it would seem to be for the highest good that Russian influence should

extend over the whole Armenian Plateau so as to give protection to the Christian population and avoid the recurrence of such horrible massacres as have recently taken place in that ill-fated region. But into the rights and wrongs of the great political controversies which are raging around the relation of the Christian powers to Mohammedan rule in Constantinople it is not worth our while to enter, nor could we hope for success were we to endeavor to forecast the outcome of events in that troubled region.

Russia's Unique Position

Russia alone has in her Asiatic provinces the undeveloped resources which may well provide for all the necessities of a growing population in the century to come. Meanwhile she has the advantage of being in possession of those high ideals of life which are furnished by the Christian religion, and which may be depended upon gradually so to modify the social conditions that the life of the people shall become adjusted to the more permanent order of things which will prevail when the limit of its possible population shall be approximately reached. Except in the case of the United States, no other nation of the world has before it the clear field for expansion that Russia has in her Asiatic possessions, and no other nation has more completely at her command the material and moral resources of modern science and Christian civilization than she has, if she but continues to use them rightly.

PART V
Natural History

XXVI

THE GEOLOGICAL HISTORY

General View

THOUGH large areas of Asiatic Russia are still but partially explored, enough is already known to give a fairly comprehensive view of its geological history.

In general, it may be said that the mountain border of the Central Asiatic Plateau, extending from the southern end of the Caspian Sea through the Hindu Kush, the Tian-Shan, the Altai, the Sayan, the Yablonoi, and the Stanovoi ranges, to the extreme east of Siberia, where it is interrupted by Bering Strait, is composed of archæan or Paleozoic rocks, though its elevation to the present lofty altitudes has taken place principally in Tertiary times. According to Mushketoff, the Pamir consists of a central mass of granite and other crystalline rocks, which form the highest elevations, reaching in some instances a height of 25,000 feet.

But intervening between these higher elevations, there are vast expanses of sedimentary strata of Silurian, Devonian, and Carboniferous ages. For the most part these are from 10,000 to 15,000 feet above the sea-level, and, though deeply eroded

by the river channels, they do not often disclose the older formation. In almost all instances the river channels in the Pamir Plateau flow in valleys of the above-named sedimentary rocks.

At somewhat lower levels, around the margin of the plateau, the river valleys are occupied by coal-bearing strata of the Triassic, Jurassic, and Tertiary ages. This is especially noticeable in the valley of the Bakshu, which penetrates from the Amu Daria near Balkh, eastward for nearly four hundred miles, where its headwaters interlock with those of the Tarim, flowing to the east. This entire valley, which extends completely across the north end of the Pamir, is everywhere filled with stratified rocks of these later ages.

But the main southwesterly extension of the Tian-Shan Mountains north of the valley of the Bakshu, is composed for a length of three hundred miles and a breadth of about one hundred miles, of crystalline and Paleozoic rocks similar to those which constitute the plateau of the Pamir. This mountain complex everywhere rises to an elevation of from 10,000 to 14,500 feet.

Passing still northward and eastward, we find that the broad valley occupied by the upper part of the Syr Daria also lies, for the most part, in strata of these later formations; while the vast complex of mountains constituting the western spur of the Tian-Shan range, which extends from the vicinity of Tashkent, northeastward to the south side of Lake Issyk-kul, with a length of six hundred and an average width of one hundred miles, is again composed of central ridges and domes of crystalline rocks flanked by those of Paleozoic and coal-bearing

strata of later age,—the Tertiary strata of the upper Syr Daria Valley, sometimes rising to a height of 10,000 feet.

To these older series of elevations belong the Alexandrovskii Mountains, and both the Western and Eastern Ala-tau ranges; but here, as in all the other cases, the parallel valleys penetrating them are occupied by later strata. Again, after crossing the Sungarian depression south of Lake Balkash, the Tarbagatai Mountains, while still maintaining the general parallelism of the continental uplift, are composed of crystalline and archæan rocks running nearly east and west, which, in their projection to the westward, form the water-shed between the Aral-Caspian basin and that of the Obi River, extending till they join the southern projection of the Ural Mountains, which also belong to the earliest geological era.

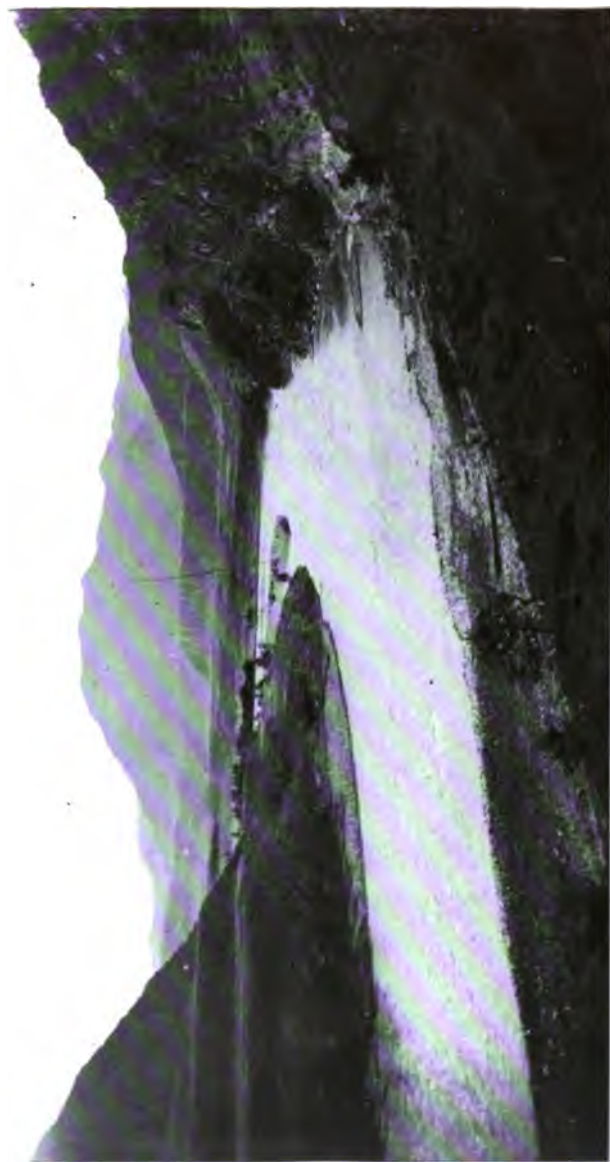
Continuing to the northeast, we find in the Altai Mountains another westerly projection from the main plateau, whose central core consists of crystalline and archæan rocks; while in their northern part Jurassic deposits with numerous rich beds of coal are found in the valleys up to a considerable height. This region is also one of the richest in minerals of all kinds,—silver, copper, lead, and zinc abounding in the southern portion; while gold, iron, and coal abound in other portions.

Substantially the same geological characteristics are presented in the Sayan Mountains, which extend along the Mongolian border for a distance of about eight hundred miles between the Yenisei River and the south end of Lake Baikal. Here the main axis of older elevation bears a little to the south of east, and consists for the most part of granitic and archæan

usual. But it is varied in the north like that of the Altai Mountains, with non-sealing sedimentary rocks of Tertiary age rising in elevations to a height of 4,000 or 5,000 feet, and deeply intersected by valleys of erosion.

The south end of Lake Baikal is likewise encompassed with crystalline and sedimentary rocks which spreading out towards the northwest form the great mass of the Transbaikalian, on whose broad swampy surface is found the watershed between the Lena, Yenisei, and Amur rivers. But here again rocks of Tertiary age are found in the local valleys very nearly up to the summit of the plateau: an area of Tertiary rocks of considerable size being exposed near the head of the Khiluk River, at the summit of the pass where the railroad crosses from the watershed of the Amur to that of the Yenisei. The northern part of this area in the upper basin of the Lena is covered, according to Kozlovskii, with horizontal sheets of red sandstone, probably of Devonian age.

Passing eastward into the valley of the Amur, we find this crossed nearly at right angles by the Great Khingan and the Borzaya Mountains, both of which maintain a general parallelism with the northwestern border line of the Mongolian Plateau, and extend from the Chinese Sea to the Sea of Okhotsk a distance of one thousand miles, dividing the country into two broad parallel valleys, the one of which may be described in general as a plateau about 2,500 feet high bordered on the west by the Yablonoi and on the east by the Great Khingan Mountains. For a breadth of about 150 miles this so-called Daurian Plateau contains numerous granitic uplifts parallel



Terraces in the Altai Mountains.

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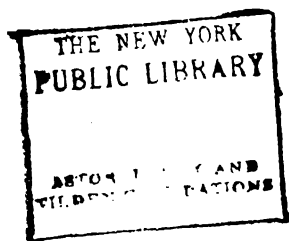
The south end of Lake Baikal is likewise encompassed with crystalline and archæan rocks, which, spreading out towards the northeast, form the great mass of the Vitim Plateau, on whose broad swampy surface is found the watershed between the Lena, Yenisei, and Amur rivers. But here again rocks of Tertiary age are found in the local valleys very nearly up to the summit of the plateau; an area of Tertiary rocks of considerable size being exposed near the head of the Khilok River, at the summit of the pass where the railroad crosses from the watershed of the Amur to that of the Yenisei. The northern part of this area in the upper basin of the Lena is covered, according to Kropotkin, with horizontal sheets of red sandstone, probably of Devonian age.

Passing eastward into the valley of the Amur, we find this crossed nearly at right angles by the Great Kinghan and the Bureya Mountains, both of which maintain a general parallelism with the northwestern border line of the Mongolian Plateau, and extend from the Chinese Sea to the Sea of Okhotsk, a distance of one thousand miles, dividing the country into two broad parallel valleys, the one of which may be described in general as a plateau about 2,500 feet high bordered on the west by the Yablonoi and on the east by the Great Kinghan Mountains. For a breadth of about 150 miles this so-called Daurian Plateau contains numerous granitic uplifts parallel

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Terraces in the Altai Mountains.



with the main Yablonoï range; but large areas are covered with eruptive and volcanic rocks, such as rhyolite, diabase, and basalt. Interspersed with these are many metamorphic and paleozoic rocks, and the whole area abounds with minerals, of which gold, silver, and iron are prominent, with small areas of coal.

The eastern portion of the Daurian Plateau as it slopes into the valley towards the Bureya Mountains contains extensive deposits of Jurassic and Tertiary age, which occupy nearly the whole area between the Zeya and Amur rivers. Granitic rocks, however, with much diorite and diabase, appear upon the north bank of the Amur for a distance of about two hundred miles above Blagovestchensk, and along the middle portion of the Zeya River.

About 250 miles farther east the Amur makes a fine section of the Bureya range, having cut a gorge, running from northwest to southeast nearly at right angles across the upturned strata for a distance of about one hundred miles, and shows the main axis to consist of granitic rocks, including, in a synclinal trough, a broad belt of Devonian strata. On the west it is bordered by extensive deposits of porphyry and basalt, and on the east by rocks of Jurassic age, which are also partly included in the synclinal trough.

Another parallel mountain range running northeast and southwest is found in the Sikhota Alin, which forms the eastern border of Usuri, extending from the vicinity of Vladivostok to the mouth of the Amur River. It is between this range and the Bureyan that the long broad valley occurs occupied by

the Lower Amur, the Usuri, and the lower portion of the Sungari River. The sections across the range which have been made, also show a core of granitic rocks and archæan strata, bordered by extensive deposits of eruptive rocks like diabase and andesite and porphyry. Jurassic strata also appear on both sides of the main chain.

From this comprehensive survey, it will be seen, that, while the main line of earliest elevation has been from southwest to northeast, extending in that direction for a distance of nearly six thousand miles, there has been a counter series of elevations nearly at right angles with the main line, making an echelon of the whole. The succession of the strata show, also, according to Mushketoff, that the elevations running northwest and southeast are subsequent in origin to the main line from southwest to northeast.

Early Geological Periods

This rapid glance at the framework of the geological system of Asiatic Russia prepares the way for an intelligent comprehension both of the general history of the great geological movements, and at the same time of some later minor movements which have had much to do in determining the history of the region.

It would seem that early in the geological history of the Asiatic continent there was a series of long parallel elevations of the earth's crust running in the main from the southwest to the northeast, and separated by depressions which were occupied by the beds of shallow seas having free access to the

ocean. During all the earlier geological ages the detritus from the mountain elevations partially filled up these sea beds, furnishing material for the older sedimentary rocks. From the Ural chain, which is now but a bare remnant of the original mass, this sedimentary material was spread far and wide over the plains of the Volga to the west and over those of the Obi Valley on the east; while from the mountains forming the Mongolian border, and from the plateau extending northeast to Bering Strait, great rivers brought down the sediment into the vast areas now occupied by the Aral-Caspian depression, the eastern side of the valley of the Obi, the entire valley of the Yenisei, and the northern portion of the Lena Valley.

Impressive evidence of the length of this period of erosion, as well as of its extent, is found in the deep broad valleys eroded by the rivers which come down from the mountain plateau. In some cases the valleys occupied by the streams are synclinal, that is, formed by a downward flexure in the crust of the earth which originally determined the course of the stream. But even in these cases as well as in many others which were entirely independent of such a movement, the amount of material removed by the ordinary erosion of the rivers is everywhere seen to be immense. The main streams which come down from the Pamir occupy waterworn gorges of many hundred feet in depth from which the material has been carried out and spread as sediment over the entire plain intersected by the Amu Daria. Similar gorges appear in the upper tributaries of the Syr Daria and of the Chu and the Ili, coming down from the western and northwestern flanks of the Tian-

Shan range. In the earlier period when the sea covered the whole area of the Aral-Caspian basin, this process of erosion had gone on until extensive deposits of carboniferous and Tertiary rocks had taken place; the material in various degrees of coarseness being spread over the whole area. But all around the margin of the southwestern, western, and northwestern base of the Tian-Shan range, there were swamps and lagoons in which vegetation grew and accumulated, forming in due time beds of peat, which, during a later period of depression, were covered with fresh deposits of silt and transformed into lignite and coal.

In the immense valley of the Obi and the Yenisei a similar process went on. The upper portions of the Irtysh, of the Obi, and of the Yenisei River have worn valleys many hundreds of feet in depth, and of great width even when crossing the strata of hard rock which intersect their courses in the lower mountain chains. All this material, as well as that which was removed by superficial erosion and carried away by the streams, was spread out over the border of the sea into which it entered, the coarser part being left near the base of the mountains, and the finer being carried to an indefinite distance into the gradually deepening water.

The upper tributaries of the Angara River, entering Lake Baikal from the Vitim Plateau and its extension south into Mongolia, present very impressive evidence of the effect of long-continued water erosion. For hundreds of miles the Selenga, the Chikoi, the Khilok, and the Uda rivers occupy troughs a mile or more in width and hundreds of feet in depth,

which they have worn in the rocks in the course of their rapid descent through the three or four thousand feet which separate the surface of the plateau from the level of Lake Baikal. All this waste is now being deposited in Lake Baikal, and it is one of the striking evidences of the youth of this lake that it was not long ago filled up by the enormous amount of sediment brought into it by these streams. The lake, which is now completely surrounded by mountains, and has a depth near its south end of 4,186 feet, is the product of those more recent geological changes of which we shall presently speak. But at an earlier period before the formation of the lake, the sediment brought down by the stream was spread out over the extensive plains now covered with Silurian, Devonian, Jurassic, and Tertiary rocks which cover the vast area watered by the Angara and its tributaries below Irkutsk. Here also in Jurassic times the highlands were bordered by extensive swamps and lagoons in which peat accumulated, and which, as in the other places mentioned, was, under subsequent changes, covered over with fresh sediment and transformed into beds of lignite and coal.

The Lena Valley has passed through a somewhat similar history. The sections given by Baron Toll show that much of the broad low plateau west of the middle portion of the Lena consists of Silurian and Cambrian strata deeply eroded by the streams; while almost the entire valley of the Yana is composed of Triassic rocks, and the immediate valley of the Lena from Yakutsk to its mouth is occupied by rocks intermediate between the Jurassic and the Cretaceous, all of these being

composed of sediment washed down from the very ancient plateau bordering the region on the southeast and limited by the Yablonoi Mountains.

A similar lesson in river erosion is easily studied along the Amur, where for hundreds of miles through the Daurian and the Great Kinghan Mountains the bed of the river lies at the bottom of an eroded channel several hundred feet in depth; while farther down, in crossing the Bureya Mountains, its channel follows an even gradient, showing that the entire work of deepening its channel had long since been accomplished. Here, as in the other rivers, it is easy to see that the material for the sedimentary rocks over the vast area east of the Yablonoi Mountains has been transported along the lines of a drainage system which was essentially the same as that now in existence.

More Recent Geological Changes

But the entire mountain system of Asiatic Russia was raised to its present high level at a very recent geological period. This is shown by the fact already noted that all along the western border of the Tian-Shan Mountains, marine Tertiary strata are found at high elevations even up to 10,000 feet; while, also, the deep river valleys of erosion, already described as characterizing the basin of the Selenga River and its tributaries coming down from the Vitim Plateau, are lined with rocks of Tertiary age. They are, to be sure, probably of fresh water origin, as are the Jurassic rocks in the upper Angara basin about Irkutsk, but even so they doubtless indicate

that a much lower level characterized the geological conditions before the formation of Lake Baikal than that now prevailing.

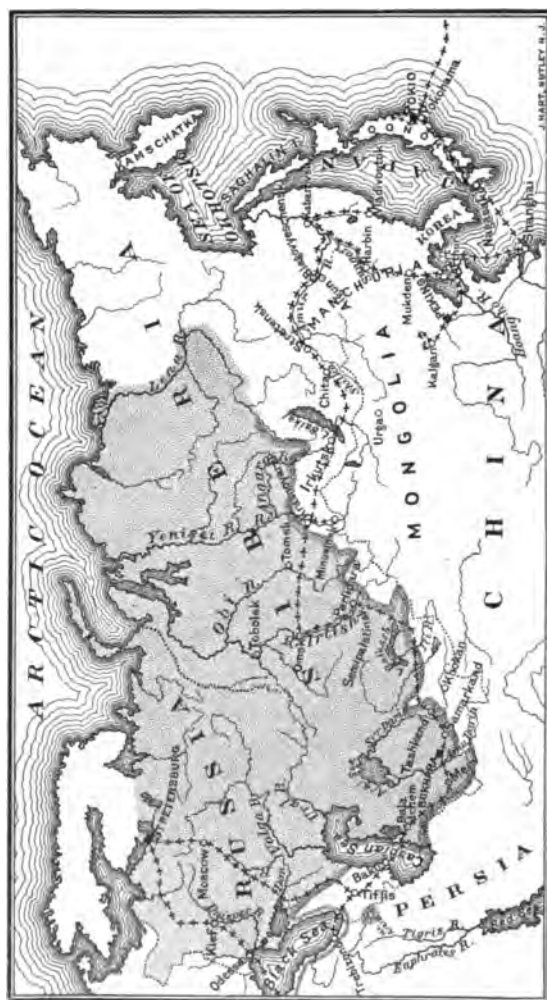
To this evidence of great changes of level since the middle of the Tertiary age may be added the existence of Lake Baikal itself, which lies in a longitudinal trough formed by the elevation of a mountain ridge on the western side of the lake parallel with the Vitim Plateau. Simultaneously with the elevation of this ridge there was a phenomenal subsidence of the whole bottom of the lake under its southern end, which, as already said, is 4,186 feet deep, or nearly 3,000 feet below the sea level. The general facts concerning this lake have been already given in a preceding chapter, to which the reader is referred. But in this connection, as evidence of its recent origin, attention is directed to the single circumstance that the lake exists at all.

Even as it is, the Selenga River has built up a large delta where it enters the lake upon the eastern side, but it is easy to see that, if this depression had existed to catch the sediment as long ago as the beginning of the Tertiary period, there has been enough material eroded from the Vitim Plateau to have filled the south end of the lake full of sediment many times over. The calculation is of such interest that it is worth while giving it in brief.

The Selenga with its tributaries drains an area of fully 200,000 square miles. Everywhere the rivers have a steep gradient, all of them descending 3,000 feet between their sources and the level of Lake Baikal, where their sediment is now

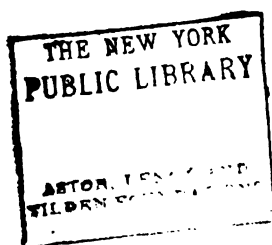
deposited. Considering the magnitude of this gradient, it is doubtless much below the truth to estimate that the superficial erosion over the area has amounted to one foot in 5,000 years, that being the rate which has been ascertained for the Mississippi River, whose gradient is much less. At that rate 8,000 cubic miles of solid material would have been removed from this basin by the streams within a period of 1,000,000 years, which we may provisionally take as a moderate estimate for the length of the Tertiary period. But reckoning the south end of the lake to be on the average one half mile deep, (which is a liberal estimate), 210 miles long and 40 miles broad, 4,200 cubic miles of material (or one half the material actually removed) would have filled the depression with sediment. Five hundred thousand years, therefore, is all the time that it would require for these streams to have filled the whole southern end of the lake. Whereas it has as yet scarcely made a beginning, the present delta covering less than one thirtieth of the area. After making all allowances for the amount of material which may have been carried into the lake where it is below water level, it would be difficult to stretch the period under present conditions longer than fifty thousand or even thirty thousand years. Previous to that time, it must be supposed, the drainage of the Selenga continued across an open country to the head of the Angara, and carried its material through that great stream into the Yenisei Valley.

Nor is the direct evidence of recent geological disturbances in this region altogether wanting. Earthquakes are a frequent occurrence,—an extensive area about the mouth of the Selenga



Itinerary -----
 Shaded portion shows Submerged District.

Map Showing Our Itinerary, a Portion of the Submerged Area, and the Border of Loess.



having been permanently submerged during a convulsion in 1862; while there are numerous warm springs along the shore, one of which at Turka, near the mouth of the Bargusin River, has a temperature of 130° , indicating the proximity of subterranean fires.

Another evidence of a rapid elevation of a broad area in recent geological times is visible in the rock terraces upon the Amur, Yenisei and Obi rivers. All the way up the Amur River from Blagovestchensk, rock shelves or terraces are a prominent feature in the scenery as one views it from the deck of a steamer. Beginning at an elevation of about 100 feet, they increase in height to several hundred feet above the river before Stryetensk is reached. Evidently the river flowed at that level until it had eroded a trough about twice as wide as it now has, enlarging considerably where tributary streams came in to assist in the erosion. Throughout this entire distance of seven or eight hundred miles the evidence is clear, that, at the time of the excavation of the upper rock shelves, there had been a long halt in the action of the elevatory forces, so that a great amount of base leveling had been accomplished, and that this was followed by a comparatively rapid elevation during, or since, which the river has eroded its inner gorge through solid rock for a length of several hundred miles and to a depth of several hundred feet. Similar terraces likewise occur on the Yenisei River both below and above Krasnoyarsk, and not only there, but on both sides of the river, for nearly a hundred miles farther south, where the stream has cut its way through the intersecting Yeniseisk Mountains below Minusinsk. Such

terraces are also abundant on the upper tributaries of the Obi where they emerge from the Altai Mountains.

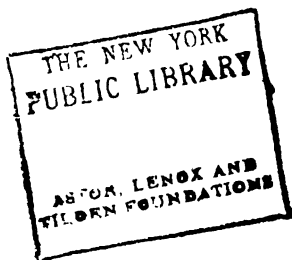
Evidence of a Post-tertiary Subsidence

But still more impressive evidence of recent changes of level over this whole area is found in the alluvial deposits which cover all the inland plain stretching everywhere from the Arctic Ocean for a considerable distance south, completely enveloping the entire basin contained between the Yenisei River and the Ural Mountains, and extending over the whole Aral-Caspian depression. The region affected by this depression includes an area of not less than 3,000,000 square miles, and was depressed, in some portions, at any rate, to the extent of 3,000 feet. It was during this submergence that the fertile soil of the vast prairies of Western Siberia, and the terraces and deltas of loess around the southern and eastern borders of Turkestan, were accumulated, together with the great loess-covered areas which furnish the richest wheat fields of southern Russia. Increased interest attaches to this depression, from the fact that it probably occurred since the advent of man, and is in some way connected with the distribution of the mammoth and the woolly rhinoceros over Northern Siberia and with their ultimate extinction. It will therefore be worth while to present this evidence somewhat in detail, a part of which may well consist of some of my own recent observations in the region for the purpose of determining more definitely its condition during the glacial period.

Starting from Peking early in May 1900, Mr. Frederick B.



Basaltic Cliff near the Dariel Pass.



Wright and myself went inward two hundred miles, and ascended the eastern border of the great Mongolian plateau near Kalgan in search of glacial phenomena. We were here in almost the same latitude as that of New York City, and in a mountainous district from 5,000 to 6,000 feet above the sea. But we found there no signs of the glacial period. We then went to Port Arthur, and made a north-and-south section through the center of Manchuria to the Amur River, and thence up the river to about latitude 54° N., being, at Chita, 2,500 feet above the sea, and at the eastern base of the Vitim Plateau, whose general level is 5,000 feet. But though we were here sixteen degrees farther north than the southern point to which the ice extended in the valley of the Mississippi, we could find no signs of the glacial period.

We then crossed the Vitim Plateau, to Lake Baikal, and, after crossing the Yenisei River, at about latitude 56° , proceeded to Omsk, on the Irtysh River, where we turned to the south, and for one thousand four hundred miles drove in a Russian tarantass along the northwestern base of the Ala-tau Mountains to Tashkent, and thence, through Samarkand, Bokhara, and Merv, to the Caspian Sea. In reality, this entire trip from Lake Baikal to the Caspian Sea is at the base of the mountains which border the great plateau of Central Asia. The distance traversed at their base was more than four thousand miles. To the southeast of us, mountain peaks from 10,000 to 16,000 feet were constantly in sight, all glistening with the dazzling brightness of miniature glaciers and extensive snowfields. To the northwest, however, there stretched a con-

tinuous plain as far as the Arctic Ocean, except where interrupted by the Ural and some minor mountains. But we found no indications that glaciers ever extended out from the mountain valleys crossed, like those which deployed over the plains of Switzerland and Northern Italy from the Alps, which are of about the same height and in about the same latitude.

On the contrary, throughout this entire region we were confronted with the evidence of a great subsidence of the land which had taken place in recent geological time, and which, in date, would correspond roughly with that of the glacial period in North America. For several hundred miles, while driving through the region south of Lake Balkash and the Aral Sea, we were evidently upon a terrace of the fine loam which is called loess, about 2,500 feet above sea-level. Indeed, at different elevations this loess extends continuously in a broad shelf along the base of the mountains, from the Irtysh River to the Caspian Sea, and is found in extensive level areas over various portions of the Caucasus and Northern Persia around the base of Mount Ararat; while the so-called "black earth" of Southern Russia is a deposit of the same material, and probably of the same age, one hundred or more feet in thickness. The distribution of this loess is the key to the whole situation.

Distribution of the Loess

Persons living in the valley of the Missouri River are familiar with the deposit in such bluffs as border the valley at Sioux City, Omaha, and Kansas City, where perpendicular sections one hundred feet or more in thickness may often be seen

which have stood for many years without crumbling down. It is not clay, but a very fine sand through which the water percolates freely, but which always retains some moisture through the effect of capillary attraction. Wells penetrating the loess never obtain water until reaching the bottom of the deposit. It can be easily cut with the spade, and caverns excavated in it make comfortable and permanent dwelling-places. The bluffs at Vicksburg, on the Mississippi River, consist of this deposit, and during the celebrated siege of that city the people found safety in caverns excavated along its side. In China millions of people live comfortably in such excavations.

Our trip through Eastern China took us through innumerable villages thus constructed. In some places in China the loess is one thousand feet in thickness, and houses may be seen on the slopes one above another, the roof of one row of houses serving as the playground for the children who live at a higher level. All Northeastern China proper is enveloped in this deposit. It is the sediment gathered from the loess which renders the great rivers of China so turbid and gives appropriateness to the name of the Yellow Sea. When forty miles out from land, the traveler upon this sea will meet a sharply defined line, on one side of which is the clear ocean water, and on the other side water which is fairly opaque with the heavy load of sediment brought in by the streams, and which is constantly increasing the shoals along the border of the continent, and adding to the margin of dry land which is rapidly encroaching upon the sea. So rapid is this process

that it has effected great changes upon the Chinese coast since the beginning of the historic period. In the year 220 B. C. Putai was a seaport; now it is forty miles inland. During the Han dynasty (about 200 B. C.) Tientsin was a seaport; now it is thirty miles inland.

Twenty-five or thirty years ago Baron Richthofen endeavored to make out that the loess was a wind deposit; and certainly he found much in Northeastern China to support this theory. Upon returning from our trip to the Mongolian frontier, we were inclined to accept it, for we had seen and experienced, in the dust-storms encountered, enough to make us ready to attribute almost anything to the power of wind. For a whole day we once rode in a cloud of dust so dense that it was impossible to see objects twenty feet away; while everywhere in the mountain valleys we saw instances where this loess had drifted into protected places, as snow does in winter. But there were constantly appearing other things which were difficult to explain by the action of wind. For example, the loess was occasionally spread out, even at high levels, in broad, lakelike basins, as if deposited by water. Also the material now most blown about by the wind is coarse sand, which is piled up in dunes quite unlike the ordinary loess deposits. In one instance we found the high walls of a large Chinese city completely buried on one side by a wind deposit; but this was coarse sand, and not loess. In many cases, also, we found long lines of gravel and pebbles interstratified with loess. Thus the difficulties of explaining everything by wind so increased that they became well-nigh insuperable.

But, on coming around to the 'northwestern side of the great Asiatic Plateau, in Turkestan, which is in almost the exact center of the continent, the wind hypothesis became entirely incredible, and evidences accumulated that the land had lately been depressed to such an extent that the water of the ocean reached the base of the bordering mountains, rising to a height, certainly, of about 3,000 feet; for, at this level, south and southwest of Lake Balkash, we found the loess spread out in such an extensive terrace that the wind would be entirely incompetent to produce the results. We were interested to find, upon visiting St. Petersburg, that the chief Russian geologists had arrived at substantially the same conclusions which we had formed. They said that, however successful Rieht-hofen might be in maintaining his wind hypothesis in Northern China, it could not account for the loess in Southern Russia.

In confirmation of this theory of a recent extensive depression of Central Asia, a number of other most interesting facts present themselves, prominent among which are those concerning Lake Baikal.

Arctic Seal in Lake Baikal

As already said, Lake Baikal lies in a longitudinal trough on the edge of the Central Asiatic Plateau, at an elevation of 1,561 feet above the Arctic Ocean, with which it is connected by the Yenisei River after flowing across the northern plains of Siberia for a distance of about 2,000 miles. A most curious fact, long known to scientific men, is that this lake is occupied by a species of seal almost identical with those found in the

Arctic Ocean. The same species with slight variations are also found in the Caspian Sea, but not anywhere else along the 3,000 or 4,000 miles which separate these bodies of water. The most probable explanation of this fact, and the one usually accepted by scientific men, is, that these species of seal were thus widely distributed during a continental subsidence in which the waters of the Arctic Ocean covered all of North-western Siberia, and extended up to the base of the great Asiatic Plateau which we followed for such a long distance on elevated shore lines in Turkestan. When this depressed area emerged from the sea, it left the seal isolated in the two great bodies of water which still remain on its former margin. So lately has this taken place, that there has not been time for any great changes to be effected in the specific characteristics of these animals.

Freshness of the Internal Seas

Another indubitable evidence of the recent great changes which have taken place in this central part of Asia is to be found in the condition of the inclosed seas and lakes which abound in it, and which have no outlets. The Caspian Sea, for example, though it receives the drainage, through the Volga River, of more than one half of Russia, besides that which comes in from the Caucasus and the valley of the Ural, has its surface eighty-five feet below the level of the ocean. The evaporation over the present area of the sea now exactly equals the amount of water brought into the basin by all these rivers. From the analogy of Great Salt Lake and of the Dead Sea, we

should expect to find the water of such an inclosed basin much saltier than that of the ocean. On the contrary, it is only one third as salt. The case of the Aral Sea is still more striking. Two great rivers—the Syr Daria and Amu Daria—empty into this sea, but there is no stream flowing out of it. But here, where we should expect very salt water, we find water which is almost fresh—so nearly so that gazelles and other animals living on islands in the sea habitually drink it. On the other hand, in the numerous small dried-up lakes which dot the surface of the region the accumulation of salt is very marked.

The only explanation of the freshness of the water in these two great seas is that there have recently been great changes both in the climate and in the level of that region. Salt is washed into such inclosed basins so rapidly that it would take no prolonged period of evaporation to render them saltier than the ocean. In general, such seas may be compared to enormous salt vats which are approaching nearer and nearer the point of saturation. In the case of Great Salt Lake and the Dead Sea this point was long since reached; but in the case of the Aral and Caspian seas little progress has been made.

It is therefore clear that this region has lately emerged from below sea-level, and, in consequence, rapidly passed through climatic changes which have transformed it from a recently well-watered region to one that is now a desert. During this transition stage, the rivers coming into the Aral Sea were so much larger than now that the sea overflowed the rim of its basin in such volume that nearly all of its salt was carried

into the Caspian, and the sea thus became practically fresh. There is a well-known and a very clearly marked deserted channel of this great stream called the Uzboi, which once connected the Aral with the Caspian Sea. So small is the amount of salt in the Aral Sea that this change must have taken place within a few thousand years. The Caspian Sea is so much larger that it would take a longer time to wash the salt out of it. Indeed, it is probable that it was never so completely freshened as was the Aral Sea. But the present small amount of salt in it bears unmistakable evidence both that the process of freshening had gone on to a considerable extent, and that it became an inclosed basin at a comparatively recent period. A rise of its water to a little over one hundred feet would now cause it to overflow into the Black Sea. These facts, while they may not directly prove the subsidence of which we are speaking, do bear striking witness to the instability of this region and to the recent great climatic changes probably dependent upon these variations of level.

Other Evidences of a Recent Continental Subsidence

At Trebizond, upon the Black Sea, we found positive evidence of a comparatively recent subsidence of the land, amounting to 750 feet. This evidence consists of a deposit of beach gravel one hundred feet thick and extending for a half mile or more, along the face of the precipitous volcanic mass of rock which forms the background to this picturesque and historically interesting city. The gravel is very fresh in appearance, and was deposited subsequent to all the rock erosion of

the locality. The very fact that it has not been all washed away by the frequent and heavy rains of this region is evidence of its recent date. Its upper surface is 750 feet above the present level of the sea. It was interesting to bring up to the imagination from this point the conditions involved in the deposition of gravel at this high level. If we supposed the 750 feet of subsidence to have extended over the whole area to the Arctic Ocean, all of Russia, except the Ural Mountains, would have been submerged.

Another clear evidence of the subsidence of the land in this region appeared in the lower part of the Dariel Pass on the north side of the Caucasus Mountains. Here, at an elevation of about 3,000 feet above the sea, it was clear that after the rock gorge had been eroded to its present depth of about 2,000 feet, it had been partially refilled by water action with clay, sand, gravel, and pebbles to the extent of from 300 to 400 feet. The fine material was at the bottom and the coarser material at the top. There was no chance for a glacier to have entered that part of the gorge, so that it was evident that the deposit was made by water during some recent extensive changes in the level.

Mr. Charles Tracy, of Marsovan, reports that there are similar terraces to that at Trebizond near Samsun, one hundred miles farther west on the south side of the Black Sea; while Prof. Charles Keyes reports the occurrence of

"extensive raised beaches on the north shore of the Black Sea at Soudak in the Crimea, where six or eight well-marked beaches are found, the highest about 500 to 600 feet above the present sea-level.

When viewed from the inner citadel of the triple-walled fortress, which crowns a precipitous point of rock several hundred feet high, above the harbor, the terraces stretch out to the eastward in a remarkable manner, as far as the eye can reach. They form a series of sharply-cut steps reaching down in succession until the present beach shelf forms the last one of the series."

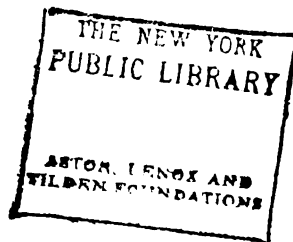
Another indication of recent and extensive changes in the level of this region has already been alluded to (p. 105) in the observations of Mr. Stadling upon some terraces containing fresh drift-wood which are found on the lower part of the Lena River 600 feet above its present level.

Advent of Man

The facts concerning man's existence previous to this submergence first came clearly to light a short time ago in the discovery by Professor Armachevsky at Kief of paleolithic implements, burnt stones, and other implements of man's occupancy in the bluff of loess which borders the Dnieper River on both sides of all the lower half of its course. The general surface of the region is here 613 feet above the sea, and is enveloped in a pretty uniform covering of from fifty to sixty feet of loess. Through all this the river has worn a broad trough 300 feet in depth. At the base of the loess, fifty-seven feet below the surface, and 250 feet above the river, in position where there has been no disturbance since the deposition. Professor Armachevsky found the remains of man referred to associated with the bones of various extinct animals such



Snowfields in the Altai Mountains. 4



as are found in the cave deposits and river terraces of glacial age in Western Europe.

In the chapter on Pre-Russian Colonization (p. 251), there will be found an account of a similar discovery, by Professor Kashchenko in 1896, of the remains of paleolithic man twelve feet below the surface associated with the remains of extinct pleistocene animals in the valley of the Obi near Tomsk. In this case the stone implements were found in connection with mammoth bones representing an entire skeleton, some of which showed that they had been split by man for the extraction of the marrow.

Siberia During the Glacial Period

In saying, however, that there was no glacial period in Siberia, it is not meant to deny that there were glaciers in the region during that period, nor that they were more extensive than those which are now found in the region; but the statement is simply made to convey the impression that there was no such extension of ice from the Asiatic glacial centers during the glacial period as there was from the centers of Northwestern Europe and Northern North America. That there was, during that period, some enlargement of the glacial fields is beyond question. In the Altai region glaciers extended somewhat lower than now, but, so far as we can learn, they came down into the valleys only a comparatively few miles; while the same is perhaps true of the Tian-Shan range. But it is certain that from neither of these centers did the glaciers

reach the mouths of the river gorges where they come out upon the great plains. In short, they remained, throughout, simply mountain glaciers of comparatively limited extent.

In Northeastern Siberia it would seem that the conditions were somewhat the same during the glacial period as they were in Alaska. According to my own observations, there were no extensive glaciers coming down from the Vitim Plateau, either to the east into the Chita Valley, or to the southwest, into the valleys of the Uda and Selenga rivers; while, according to Professor Schmidt, who has made extensive explorations in the region, there are no certain signs of glacial action in the Yablonoi Mountains. Farther north, however, in the latitude of Okhotsk, there are, according to Professor Tschernyshev, indications of an extensive glacial occupation of the Stanovoi Mountains above the sixtieth parallel of latitude; while, as has elsewhere been described, there are extensive areas of stagnant ice over the lower part of the Lena Valley and in the Arctic Littoral, and upon the New Siberian Islands from which so many remains of the mammoth have been derived. Baron Toll speaks of this as a "fossil glacier," supposing, it would seem, that there had been a movement of ice from the continent to these islands. It has been shown by Dr. A. C. Lane, however, that where the average summer and winter temperature is that of Yakutsk, frost would in time penetrate to a depth of six hundred feet, which is about the present limit in that locality; the soil being permanently frozen to that depth in the lower Lena Valley.

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At the present time numerous glaciers exist both in the Tian-Shan and Altai mountains. In describing the passes we have already spoken of the ice-cap which covers the summit of Khan-tengri, which rises to a height of 24,000 feet, and projects glaciers down upon all sides through the various river troughs to a level of about 12,000 feet. Another glacial center is about one hundred miles to the west directly south of the east end of Lake Issyk-kul, from which glacial streams descend both into the Tarim basin and into the Naryn River, which flows into the Syr Daria. Another glacial center of considerable extent is found just south of Verni, in the Western Ala-tau range. From this, glacial streams are sent forth both into the headwaters of the Ili and of the Chu. Still another glacial center along the main range of the Tian-Shan Mountains is found south of Aulieata, from which perennial streams flow north into the Talas, and south into the Chatkal, which flows past Tashkent.

Still another center of glaciers is found in the Alai Tagh range between Kokand and the upper basin of the Syr Daria and the Waghesh River, one of the head tributaries of the Amu Daria, forming the northern boundary of the Pamir. There are as many as four of these, covering the summits above 10,000 feet, from which perennial streams flow into both the Amu Daria and the Syr Daria, and from the western one into the Zerafshan, which waters the valley of Samarkand and Bokhara.

South of the Waghesh in the Pamir, Mount Kaufmann

(22,500 feet) and Mustagh Ata (25,800 feet), together with two or three other peaks rising to an elevation of nearly 20,000 feet, sustain glaciers of considerable extent.

In the Altai Mountains, though the elevation is nowhere much above 11,000 feet, glaciers are still found which would compare favorably with those in the Alps; and, being readily accessible from Semipalatinsk, Barnaul, and Kusnetsk, present unrivaled attractions for tourists.

Rise and Fall of the Mammoth

A survey of the vast region in Central Asia under investigation fairly compels one to treat it as a whole, and to assume that all parts of it have partaken in the subsidence, though perhaps not all to an equal extent. The evidence of man's existence at that early time just presented is confirmed by the occurrence of mammoth and rhinoceros bones and carcasses along the Arctic Littoral, especially between the Chatanga and Lena rivers and on the New Siberian Islands.

As already stated, both drift-wood and the remains of the mammoth are found in the interior in the deposits of abandoned streams overlying thick strata of pure ice, which here plays the part of rock. On the New Siberian Islands, also, the ice takes the place of rock strata, and is covered by a considerable depth of sand and gravel, in which are buried the remains of mammoth and rhinoceros.

There has been so much curiosity and so many attempts to explain the presence of the mammoth in these conditions, and to account for his subsequent extinction, that we may be par-

doned for presenting a theory suggested by the broad range of facts which have lately come to our notice.

The original home of the mammoth is generally supposed to have been in Southern Asia, where his near relative, the Asiatic elephant, still lives. But, wandering from his birthplace, he became distributed over almost the entire north temperate and Arctic zone, his remains being abundant as far west as the British Isles, and eastward over all the northern part of Siberia, whence he seems to have crossed to Alaska, where innumerable remains have been found. Following down through British Columbia, he spread over California, and, following up the Fraser and Columbia rivers, reached the basin of the Mississippi and the Red River of the North, and continued his migrations to the Atlantic coast, leaving his bones to be preserved in the peat-bogs and gravel terraces at frequent intervals over the whole region, as far south as Mexico.

At first it was thought from his being so large an animal, and so related to the elephant, now living in India, that his presence in Northern Siberia implied a warm climate. But upon the discovery of fresh carcasses in the frozen gravels bordering the Arctic Sea, it was found that he was amply prepared to endure cold weather, having not only long hair, but a thick and closely matted coat, which was short and woolly. At the same time it was found, from the remnants of food preserved in his teeth and stomach, that he fed upon the twigs of trees and underbrush such as are now found in Siberia. Indeed, the mammoth seems to have lived in Siberia when the conditions closely resembled those of the present time, very

likely wandering to the north over the tundras to the margin of the sea during the summer, and retiring to the evergreen forests for protection during the winter. Quite likely he could reach the New Siberian Islands on the ice before it was broken up in the spring, but he could scarcely have crossed Bering Strait to America unless the land had been elevated sufficiently to form an isthmus connecting the two continents. This, however, is by no means improbable, since the depth of water in Bering Strait is nowhere more than 180 feet.

Taking the facts altogether, it seems most probable that the mammoth wandered to Northern Siberia over highlands which remained unsubmerged during the period of the last extensive subsidence, to which we have referred, when all Western Siberia and Turkestan were enveloped with an interior sea which perhaps also extended through the Sungarian depression, forming, where the Desert of Gobi now is, an interior body of water as large as the Mediterranean. The effect of such a vast body of water stretching to the middle of Asia would be sufficient of itself to modify the climate of the whole northern region, making it both moister and warmer, and causing vegetation to be abundant even north of the Arctic Circle. In these conditions the mammoth and the woolly rhinoceros would find a congenial home in the broad area extending from the Yenisei to the Lena River, and Bering Strait.

But upon the re-elevation of the land and the disappearance of these vast inland seas, the present extreme and trying climatic conditions would ensue. Verkhoyansk, east of the Lena River is the coldest place in the world, the thermometer de-

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scending to 90° Fahrenheit below zero in January, and going up to more than 90° above in the summer; while Yakutsk occupies the center of greatest extremes of temperature, the thermometer ranging from 84° below zero in the winter to 102° above in the summer. It therefore would not be at all surprising that, after having spread over the recently elevated territory in more genial conditions, the mammoth should at last have succumbed to the extreme climatic variations of later times and become extinct, leaving his numerous remains to excite the wonder and pique the curiosity of generations of men who, thousands of years afterwards, should follow in his footsteps, and traffic in his bones.

Possible Confirmations of the Flood

It remains but to call attention to the theory elsewhere advanced,* that possibly this most recent subsidence in Central Asia is to be correlated with those traditions of the universal flood which are so abundant in ancient literature and of which the account of the Noachian deluge is the best example. Occurring as it did near the center from which the human race seems to have spread itself over the world, and accompanied by so great a destruction both of animal life and of man, it would seem eminently fitted in some of its special stages to have impressed itself upon all the members of the human race who survived its destructive influences, and who were thus able to transmit the story to their descendants. Much con-

* McClure's Magazine for June, 1901, and Bibliotheca Sacra, for July and October, 1902.

firmatory evidence of such a catastrophe is to be found in the extensive loess deposits in the district of Erivan about the base of Mount Ararat, and in extensive recent water deposits over the highlands of Western Armenia and Western Asia Minor. But the subject is too vast and complicated to be discussed at length in this connection. It is sufficient thus briefly to refer to it as a suggestion for further thought and investigation.

XXVII

THE CLIMATE

INASMUCH as Russia and her Asiatic possessions include the whole northern half of the largest continent on the earth, a study of its climate is a study of the best type of pure continental atmospheric conditions and their results. Its thirty-five degrees of latitude (42° to 77° N.), give ranges in temperature from -90° F. in the northeast to $+111^{\circ}$ F. in the southwest. The distribution of mountains and bodies of water gives precipitation variations from seventy-eight inches (200 c.ms.) on the Black Sea to less than four inches in the region south of the Aral Sea.

The publication, in 1900, of "The Climatological Atlas of the Russian Empire," by the Nicolas Physical Observatory at St. Petersburg, includes the results of the facts gathered by this observatory since its founding (1849-1899). It is a large duo volume, containing eighty-nine double-page charts and fifteen tables. The results are obtained from observations taken at 564 points in, and bordering on, Russian territory. Of these, 225 are in Asiatic Russia, and thirty-one near the border, especially in China and Persia. Ninety-two of the Asiatic stations have been established during the last five years, but sixteen have been in operation for over thirty years, while

fifty-seven more have been established between ten and twenty years. Educated exiles have done much to extend our meteorological knowledge in Siberia. As an example, the observations at the pole of cold of the world, Verkhoyansk in Northeastern Siberia, have been taken by the scientists S. Kovalik and Voynaralsky, political exiles in that region. Their observations cover the time since 1887. This number of stations seems small to cover so great an area; but the old and new ones are well mixed and scattered from the Sea of Okhotsk to Turkestan, and from the Desert of Gobi to the Arctic Ocean; so that the results are more accurate than might at first appear. To the kindness of Mr. M. Rikatcheff, present director of the Nicolas Physical Observatory at St. Petersburg, and to this Climatological Atlas, I am indebted for the facts contained in the text and accompanying maps of this chapter.

Barometric Pressure

The chart of the annual atmospheric pressure shows a marked high area in the south-central portion of Siberia, with its center about midway between Lake Baikal and Lake Balkash, where the average is 30.22 inches (767 mm.). In the Summary of International Meteorological Observations published in 1893, and based on records for the years 1878 to 1887, the high barometer area of 30.20 inches is placed north of Lake Baikal and extends halfway to the Arctic Ocean, the highest point being 30.38 at Yakutsk. The more extended and accurate observations since that time have shown that the annual pressure at Yakutsk is less than 30.10, and that the center of permanent

high pressure lies not northeast of Lake Baikal, but in the central area over the highlands of the Altai Mountains at the headwaters of the Yenisei, the Obi and the Irtysh river. Prof. Rikatcheff notes that the isobars are all nearly parallel to the coast line, except in the northwest, where they are deflected towards the center.*

The low pressure areas are found to lie over the Pacific Ocean east of Kamchatka and over the Arctic Ocean north of the Scandinavian peninsula, while the Black Sea produces a slight low area in the southwest.

This distribution of pressure gives general west and southwest winds in Russia and Western Siberia, northwesterly winds in Eastern Siberia, and northeasterly winds with exceptions near the mountains and on the north shore of the Caspian Sea in the Transcaspian and Aral Sea region. That is, there is a general anti-cyclonic movement of air out from the central high pressure area. The most pronounced exception is the cyclonic movement over the Black Sea and due to its influence. In the Tian-Shan Mountain region, the winds blow to the northeast towards the center of the high. There is evidently some disturbing element to the south of here, in a region where we have as yet no adequate observations.

Taking the barometer pressures for the different seasons, using the normal pressure charts for the months of January, April, July, and October as the type for the seasons, we find that the shifting of the high over the continental area in winter to the ocean during the summer is very clearly shown.

* Atlas Climatologique de l'Empire de Russie. p. 9.

In January practically the whole of Siberia is covered by a high barometer pressure with its center just south of Lake Baikal, where the normal for the month reaches 30.65 inches (778 mm.). The effect of the larger land area on the height of the winter barometer pressure is seen by comparing this normal with that of Idaho Falls in the United States, which has a January normal of 30.24, and is the highest in North America. That is, the barometer stands .41 of an inch higher under the Asiatic high than under the North American in January, and in fact the whole winter.

The axis of the high barometer area is northeast and southwest, which gives a general wind movement in Siberia from the southwest. The effect of this on the climate will be seen later when we consider the temperature.

In April the Asiatic high has fallen to 30.22 inches, but still has a distinct center half way between lakes Baikal and Balkash. There is, however, a marked uniformity of pressure over the whole of Siberia, the lowest being at the southern end of Kamchatka where it is 29.83 inches, giving a range of less than .4 of an inch, while the greater part of the country lies between the isobars of 29.94 and 30.10 inches.

In June the high area is all broken up, and by July the shifting of the oceanic low to the continent is complete, and a great area of low pressure is found over Siberia. The center of this, with a pressure of 29.63, is south of the Russian possessions over the western extension of the Desert of Gobi sometimes called the Tarim Desert, which lies south of the Tian-Shan Mountains. A large and distinct lobe of this low

area less than 29.70, projects to the northeast so as to cover the larger part of the Yakutsk district. This gives a great cyclonic movement of the winds where in the winter there was an anti-cyclonic movement.

Towards the Pacific and Arctic oceans the barometer pressure gradually rises.

In the chart of the summer atmospheric pressure it is to be noted that the low area is much more pronounced in Asia than in North America, the larger continent giving the greater extremes. In America the lowest normal is at Yuma, on the Gulf of California, where the pressure is 29.80 inches. From here the low area extends northward over the hot arid and desert regions of the southwest. This is not as low as the Asiatic (29.63 inches) by .17 inch.

By the middle of autumn, October, the low area has shifted again to the Pacific, and a high area, with a pressure of 30.34 inches, has become established between lakes Baikal and Balkash.

A rather full description of the position of the high and low barometer areas and their resulting winds has been given, because on these depend all the meteorological facts now to be considered.

Temperature

The map of the isotherms showing the annual temperature does not give a fair idea of the actual rigor of the climate, because the difference between the winter cold and summer heat is so enormous. The isotherm of 32° F. passes through

Archangel, Tobolsk, Tomsk, the north end of Lake Baikal, Chita, Blagovestchensk, and the southern part of Kamchatka ; while an annual temperature of over 50° F. is found throughout the Aral, Transcaspian, and Caucasus regions, and reaches as high as 68° F. south of the Caspian Sea.

As already remarked, the pole of cold for the world is found in the center of the Yakutsk district at Verkhoyansk, where the normal monthly mean temperature for December and January is 54° F. below zero, and for February 47° F. below zero. It might be noted, for the sake of comparison, that the lowest monthly mean in North America is —30° F. on Great Slave Lake. The position of this point of extreme cold is not in the north-central part of the continent, as might be expected, but considerably to the northeast of it. This is due to the southwesterly winds, circling around the great winter high pressure area, which blow from the Atlantic across Europe and Western Siberia, modifying the temperature enough even at that great distance to push the pole of cold at least six hundred miles to the northeast of its natural position.

The lowest temperature ever observed on the earth was at this pole of cold, Verkhoyansk, where it has fallen to —90° F. (—67.8 C.). At Yakutsk it has fallen as low as —84° F. and in the more populous region at Krasnoyarsk to —67° F. at Irkutsk to —51° F., at Omsk to —56° F., and at Tobolsk to —58° F.

During the whole winter, but more especially the late fall and early winter, Lake Baikal has a pronounced modifying influence on the temperature of the region immediately sur-

rounding it. In December the normal temperature at the head of the Angara River, forty miles above Irkutsk, is 18° F. higher than that of the country one hundred miles from there in any direction. As the winter advances, this difference becomes less. In January it is but 14° F. higher than the surrounding country, and in February not over 7° F. higher.

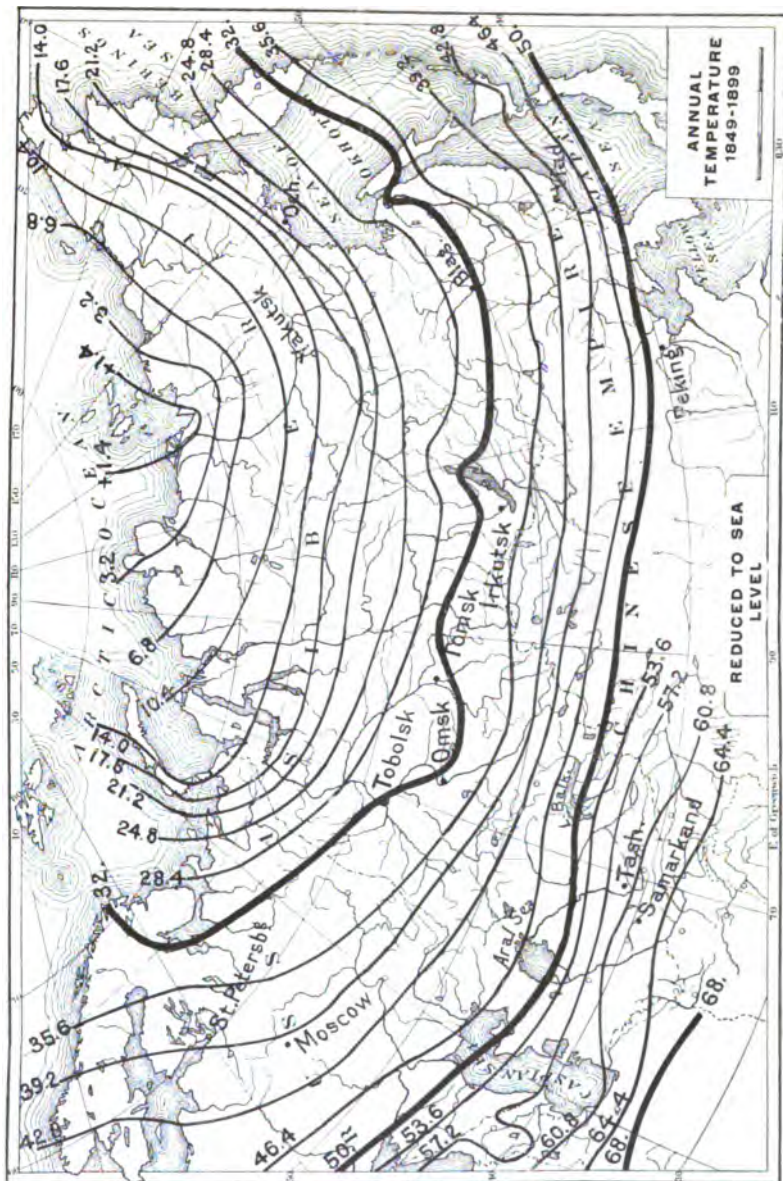
With the exception of the very southwestern part of Asiatic Russia, the springs are very late and the autumns correspondingly early. The isotherm indicating a normal temperature of 32° F. for April, passes a little south of Archangel, just north of Tobolsk, through Omsk, and then swings off in an easterly direction north of Lake Baikal to the central part of the island of Sakhalin in the Pacific. The corresponding isotherm in North America lies considerably north of the United States-Canada boundary in the west, dips south into North Dakota, then crosses the north end of Lake Superior, and curves gradually to the northeast, reaching the Atlantic about the middle of the Labrador coast.

The summer temperature of Siberia is high, the maximum often rising to oppressive degrees. The isotherm of 68° F. for July passes just south of Moscow, north of Omsk, south of Tomsk, then swings off considerably north of Lake Baikal to latitude 60°, where it continues to the east till near the Sea of Japan, when it turns abruptly south and passes below Vladivostok. In the arid plains and desert south of the Aral and Caspian seas, the normal rises to 90° F. and even 93° F. On the map showing the normal temperatures for July, the cooling effect of Lake Baikal on the immediate vicinity is clearly shown,

reducing the temperature over the lake 10° F. In August and the early autumn its influence is comparatively slight.

The limit to the region in which the maximum temperature has been known to rise to 95° F. passes through St. Petersburg, swings to the south across the Urals, then north, crossing the Obi River three hundred miles below Tobolsk, turns south again to Tomsk, and then works northeast, reaching as far north as latitude 68° in the district of Yakutsk. Near the Pacific coast it turns suddenly south and passes through Vladivostok. The limit of a maximum of 104° F. passes up the east coast of the Caspian Sea, curves around its north end to the Caucasus, works north to the latitude of Moscow, although several hundred miles east of there, it turns southeast to Semipalatinsk, passes just south of Irkutsk across the south end of Lake Baikal, and then in a curve around the north end of the Desert of Gobi, turns south to the Gulf of Pechili. In the desert regions of Turkestan and the Caspian Sea the temperature runs much higher. At Tashkent the highest official record is 108° F. while at Kizil Arvat, in the desert east of the south end of the Caspian Sea, it has gone up to 111° F. More remarkable than this, however, is the temperature of 102° F. recorded at Yakutsk, in 63° N. Lat.

From these figures, leaving out the hot desert region of the south, it is evident that Siberia is not only a land of great cold, but also of intense heat. The center of greatest annual range of temperature on the earth is found in Northeastern Siberia, and lies somewhat south of the pole of cold. Yakutsk, with its winter record of -84° F., and summer record of 102° F.,



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has an absolute range of 186°, and yet for 270 years this town has flourished, and now has a population of over 5,000.

Relative Humidity

Asiatic Russia, as regards relative humidity, or the amount of invisible moisture suspended in the air, is divided into two distinct sections. The atmosphere in all of the northern part, of Siberia, is quite moist, although the precipitation is slight. It has an annual relative humidity of over 70 per cent, 100 per cent representing complete saturation of the air, which increases steadily to the north, and reaches over 85 per cent on the Arctic Ocean at the mouths of the Obi, Yenisei, and Lena rivers. With the exception of the very northern part, this is about the same as in the United States, where from 70 per cent to 80 per cent is a fair average.

The southern part, or Turkestan region, on the other hand, is very dry. South of the Kirghiz Steppes the relative humidity is less than 70 per cent; at Tashkent but 60 per cent, over the elevated Pamir 50 per cent, and over a large area south of the Aral Sea including the Oasis of Merv, it is but 50 per cent.

During the winter months, December, January and February, the whole of Siberia has a relative humidity greater than 80 per cent, and during February it reaches 90 per cent around the mouths of the Obi and Yenisei rivers. At this time, also, the atmosphere over the southern area is more moist than at any other time of the year. The region with a humidity of 80 per cent extends nearly to Lake Balkash and south of the Aral Sea; while at Merv it is above 70 per cent most of the

time. In the Caucasus the range is from 70 per cent to 80 per cent. The comparatively high relative humidity of 70 per cent, which prevails around Merv during February, does not last long. In April it is 50 per cent, in May 40 per cent, in June 30 per cent, and at its lowest in July, when it is but 25 per cent. After this it increases as gradually as it fell, reaching 50 per cent in November. During the three summer months the whole of the Turkestan area has a relative humidity less than 55 per cent. Siberia has more uniform conditions. Its atmosphere is the driest during June, when the greater part of it is included between the 60 per cent and 70 per cent lines. The extreme northern part does not fall below 80 per cent, and usually ranges between 85 per cent and 90 per cent. The coast region near Vladivostok has a relative humidity of from 70 per cent to 75 per cent in winter, but increases to 85 per cent in the summer.

If we except the Turkestan region, it will be seen that Russia in Europe and all her Asiatic possessions have a remarkable uniformity as regards the relative humidity.

Precipitation

Russia in Europe and her possessions southwest of the Caucasus and on the Pacific coast are well watered, while the enormous stretch between is but scantily watered, and the great Transcaspian region is a desert waste, except where irrigated by the rivers flowing down from the high mountains of Southern Turkestan. The precipitation throughout the more

thickly inhabited section of Siberia is about the same as that in the western part of Kansas, Nebraska, Iowa, and Dakota, and slightly less than that of the wheat region of Manitoba.

The section of heaviest precipitation is south of the Caucasus at the east end of the Black Sea, where the mountains squeeze the moisture out of the warm winds from the sea, and precipitate it in frequent rains. The two centers of heaviest rainfall are at Batum, and farther north on the coast at Sogu, where the normal for the year reaches seventy-nine inches. From here eastward the amount decreases very rapidly, and on the Caspian Sea is less than eleven inches, except around Baku, where it is slightly greater. On the Pacific coast the southern part of Kamchatka has over twenty inches, and the extreme point over thirty-nine inches. The lower Amur and the Maritime Province are well watered, with from twenty to thirty inches.

Roughly speaking, Eastern and Southern Russia and the southern half of Siberia receive between eleven and twenty inches of precipitation. Also the high mountains of Southern Turkestan receive between eleven and sixteen inches. All the remainder of Asiatic Russia has less than eleven inches. Most of the arctic tundra region of the north and northeast has less than eight inches. The districts of Akmolinsk, Uralsk, Astrakan, the Transcaspian region and most of Turkestan receive less than eleven inches a year, so that the vegetation, except in the irrigated portions, is only fit to furnish grazing for the cattle and sheep of the nomad tribes. Furthermore, a large

part of this area south of the Aral Sea has less than four inches, and is an absolute desert waste, except along the immediate banks of the Syr Daria and Amu Daria which cross it.

Russia and Siberia receive most of their precipitation during the summer, especially July and August. The number of days with rain during the three summer months throughout all this area is between thirty and forty, except in Central Russia and along the middle course of the Yenisei River, where it is slightly greater. An irregular area extending from St. Petersburg and Moscow through Perm and as far east as Tobolsk, receives over 7.88 inches of rain during the summer. After a break of between four and five hundred miles, this belt begins again at Tomsk, and extends southeastward in a narrow strip to the south end of Lake Baikal, where it swings north over the lake, and then, turning eastward, broadens out so as to include the whole of the Amur Basin, the lower part of which from near Blagovestchensk, and including Khabarovsk and down the coast to near Vladivostok, receives over 11.82 inches. To the north of this almost continuous belt across Russia and Siberia, the summer precipitation gradually diminishes to the Arctic Ocean, where it is less than three inches.

In the Transcaspian region the month of maximum precipitation is March, further north April, around Lake Balkash it is May, while in the steppe country of Semipalatinsk and Akmolinsk most of the rain falls during the early summer months, June and July. The amount of rainfall during the spring season in the Transcaspian and Turkestan region, with the exception of the mountains to the south, is nearly two

inches, that is, one half of the precipitation for the year. The maximum precipitation on the east coast of the Black Sea at Batum and north of there is during January and December, the total for the winter season being 20.64 inches. The sections around Baku, on the Caspian, and the island of Sakhalin, in the Pacific, receive their maximum amount of precipitation during September.

Throughout Russia and Siberia the minimum amount of precipitation comes during January, February and March, while in Turkestan it is during August and September. The total summer rainfall is between four tenths of an inch and one inch, and the number of days with rain from five to ten.

Diagram 1 gives four typical precipitation percentage curves for the seasons and does not represent minor monthly fluctuations. The curve for Vladivostok shows a winter minimum of 5.5 per cent reached during January and February, with a maximum of 44 per cent in summer, when it reaches its highest during August. This curve much resembles that for New York City. The curve for Irkutsk, with its very high maximum of 61 per cent for the summer and reaching its highest during August, is the characteristic curve for most of Siberia. The percentage curve for Turkestan is well represented by that for Bokhara, where 46 per cent falls during the spring and 32 per cent during the winter, leaving but 22 per cent for the other half of the year. That is, during the summer and autumn only .92 of an inch falls against 3.24 inches during the other half year. This spring season is moist enough to furnish for a short time a profuse vegetation, so that for a while the desert

blossoms like the rose, and the Kirghiz Tartars have plenty of grazing for their sheep and cattle. The Batum rainfall is quite uniform with its maximum in the autumn when 36 per cent of the 86 inches falls.

It is interesting to note that in the region of the Middle Yenisei, where there are but eleven inches of precipitation a year, there are 160 days on which it falls; while at Batum, where they get 78 inches, there are only 120 days with rainfall. In the Transcaspian region there are between thirty and forty days with precipitation, and in the southern part of the districts of Akmolinsk and Semipalatinsk there are between forty and eighty. The Island of Sakhalin is favored with between 120 and 160 days with precipitation.

The percentage of clouds increases from 35 per cent south of the Aral Sea and the Desert of Gobi to 65 per cent in Northwestern Siberia and 75 per cent at Archangel in Russia. The larger part of Siberia has a cloud percentage of from 55 per cent to 65 per cent, which is quite evenly distributed throughout the year.

Freezing and Opening of the Rivers

As a large part of the communication in Siberia is by river boats, the dates of the closing and opening of navigation are of great interest and importance. The mouth of the Obi freezes over about October 23 and remains closed until May 31, a period of 220 days. The mouth of the Yenisei closes ten days earlier, October 13, and does not open till June 10, a period of

240 days. The Lena at its delta freezes October 3, and remains so for 260 days, or till the 20th of June.

The Irtysh River from near Pavlodar to its junction with the Obi freezes over between November 2 and 12, and opens in its southern portion and near Tobolsk between April 21 and May 1. At Omsk, and near its union with the Obi, it opens between the 1st and 11th of May; that is, it is closed from 170 to 180 days. At Tomsk the river Obi freezes on November 2, and opens on May 1, being closed 180 days. The Yenisei from Krasnoyarsk to Yeniseisk and several hundred miles further north does not freeze till after the 12th of December, and opens between the 1st and 11th of May; so that it is closed about 170 days. The upper Angara and Selenga rivers are closed 170 days, from November 12 to May 1. The Lena at Yakutsk is closed 215 days, from October 18 to May 21. The upper Amur and its very mouth close about the 12th of November, while the river at Khabarovsk does not close before the 22d of November and all but the mouth opens by May 1, and the mouth by May 11.

XXVIII

FLORA AND FAUNA

Flora

ASIATIC Russia covers such a vast territory of widely different physical and climatic conditions that its flora is very diversified. For convenience the region may be roughly divided into the Arctic Tundra, the Forest, the Steppe, the Desert, and the Mountain, with its sub-divisions into the Sub-Alpine and Alpine zones. From this general division, however, should be separated the Lower Amur and Kamchatka regions.

1. *The Arctic Tundra*.—The flora of the Arctic Tundra very much resembles that of European Russia, especially in Western Siberia. To the east, numbers of American species are found, so that some authors would make two sub-divisions in this zone. One extends from the Urals to the Yenisei River, and the other from there to Bering Sea. According to Semenov, from whom we freely quote:

“ Nearly all this zone's characteristic low growing, stunted shrubs,— for example one species of arbutus (*Arctostaphilus alpina*, Ad.) the heathers or andromedas (*Cassiope tetragona*, Don., *C. hypnoides*, Don., *Phyleodoce saxifolia*, Salisb., *Loiseleuria procumbens*, Don.), a species of ledum (*Latifolium* Ait.), also belonging to the European flora, a

solitary species of the polar azalea (*Osmothamnus fragrans*, DC), and one polar willow (*Salix arctica*, L.)— are not met with in European Russia.*

On the northern border of Taimur Land, during the short summer Nordenskjöld found that

“the plains were all covered with a very green continuous vegetation, which, however, on a closer examination, was found to be not a true turf but a mixture of grasses, allied plants, and a large number of different kinds of mosses and lichens. Actual flowers were found only sparingly. . . . On the other hand the abundance of luxurious lichens and mosses was striking.” Of flowering plants Dr. Kjellman collected thirty-four in this region.†

On the Taimur Peninsula, Middendorff found

“one hundred and twenty-four plants, among which were the very lowest, it might be said, dwarf shrubs of the arctic species of birch (*Betula nana*, L.); willow (*Salix polaris*, Wahl., *S. lanata*, L., *S. glauca*, L., *S. arctica*, Pall., *S. taimyrensis*, Trautv.) and also a ledum (*Ledum palustre*, L.) and an andromeda (*Cassiope tetragona*, Don.); and of herbaceous plants, seventeen species of *Cruciferae*, fourteen *Compositae*, seven *Stellariae* (*Alsine*, *Stellaria*, *cerastium*), twelve stonecrops (*Saxifraga*), six species of *Pedicularis*, five astragals (of the genera *Phaca* and *oxytropis*), five *Rosaceae* (*Dryas Sieversia*, *Potentilla*) and six crowfoots (*Ranunculus*, *Caltha*, *Delphinium*). Of the one hundred and twenty-four plants mentioned, thirty do not belong to the polar types, but are common to the whole of Siberia, and for the most part cross over on the one side into Europe, and on the other into America. The remaining ninety-four plants are completely arctic

* Siberia and the Great Siberian Railway. p. 29.

† For his list see The Voyage of the Vega. p. 253.

types. Much more than half of them (fifty-four) are met with over the whole polar zone, alike of the Old and of the New World, and in part come forth upon the Alps of the Altai Sayan range; but some are peculiar to Siberia alone (twelve), or only appear outside in Europe (ten), or more frequently in America (eighteen) species." *

To the east, in the Yakutsk district,

"the surface vegetation of the tundras consists principally of moss, of the *Polytrichum*, *Bryum*, and *Hypnum* varieties. From underneath the dark brown surface, grass crops up in places, here and there forming grass plots, but more often growing in separate patches on the bare clay soil. This kind of grass flora not only closely resembles that of the corresponding parts of Siberia proper, but is also much like the flora of Western Europe. Thus, out of ninety-two distinctly flowering plants collected by Nordenskjöld's expedition, at their winter quarters beyond the eastern extremity of the Yakutsk frontier country, but still on the shore of the Arctic Ocean, more than two thirds, namely sixty-three, were varieties common to the arctic zone of Europe but not descending into Russia in Europe; seventeen were American varieties also common to the arctic zone of Siberia, but not known in European Russia, whilst twelve were exclusively Siberian arctic forms. Very few of these latter are peculiar only to the northeastern corner of Siberia. . . . The local flora is characterized by the large amount of gramineous plants, which in some places form a continuous sward. There were in all thirteen different kinds found, and amongst these the original varieties were *Glyceria vilfoidea*, *Th. Fr.*, *Gl. vaginata*, *I. Lge.*, *Gl. Arctophylla effusa*, *I. Lge.* There are plenty of bushes of different kinds of low polar willows, the rarer varieties being *Salix chamissonis*, *And.*, *S. cuneata*, *Trautv.*, and *S. boganiensis*, *Trautv.*"†

* Siberia and the Great Siberian Railway. p. 39.

† Ibid. pp. 47-48.

The vegetation here advances very rapidly in the early summer. The first flower that Nordenskjöld observed in the spring, when he wintered in the northern part of Yakutsk, was the spoonwort (*Cochlearia fenestrata*, R. Br.) which bloomed on June 23d. Within a week the whole tundra was covered with flowers.

Towards the southern part of this tundra region, the fringe of the forest belt appears in dwarfed lichen-covered trees, mostly birch, which put forth only a few buds a year, and after a hundred years of such existence are not more than a few feet high.

2. *Forest Zone.*—The forest zone extends across Asia from the Urals to the Pacific, and is bounded on the north by the Arctic Tundra, and on the south by the Aral-Caspian steppes and the Mongolian steppes and deserts. Within it are included what the Germans call the "Mountain Forest" zone, extending from the Tian-Shan east and northeast to the Pacific Ocean. In some places the forests are dense and unbroken, as along the Obi Valley; in others, they are thin, as in the southeastern part of Transbaikalia; while to the north they deteriorate into thickets of dwarf birch.

From an economic point of view the forest lands may be divided into the Northern Forest of Tall-Stemmed Trees, the Birch Forests, and the Mountain Woodlands. The first of these, the Forest of Tall-Stemmed Trees, extends uninterruptedly from the Urals to Kamchatka. In the western part it covers the northern section of Tobolsk, Kainsk, Tomsk, and

Mariinsk. In Eastern Siberia it occupies the greater part of the country and becomes indistinguishable from the Mountain Woodlands of that region.

There are very few deciduous trees in this zone, except around the swamps, where aspen, willow, and birch appear. The common trees are the conifers, the "pine, larch, pitchpine, fir, and so-called cedar." In Tarsk, Tobolsk, and Turinsk there grows, as underwood, a lime tree from which the local inhabitants get bark and bast.

"The forest reaches of this vast zone have up to the present time been abandoned exclusively to the forces of nature, . . . but preserve within themselves an inexhaustible supply of splendid building material. There are many localities where for tens and hundreds of versts [one verst equals two thirds of a mile] in every direction stand clean plantations of pine, which with their interlaced summits hide the sky. The absolutely naked trunks rising perfectly straight to an enormous height are so monotonous, that a man who once chances into such a part of the Siberian taiga, [primeval forest] or even a wild beast, cannot find his way out again. Experienced native trappers are afraid to penetrate into these, in their opinion, enchanted spots, and they record every step they take by scoring the trees." *

The Russians, however, with their fields of grain, are encroaching on the southern edge of this forest belt; and, with their encroachment, great forest fires are becoming more and more numerous, and destroying vast areas of fine timber which is replaced by a motley assortment of underbrush.

The Birch Forests belong partly to the steppe flora zone.

* Siberia and the Great Siberian Railway. p. 117.

These trees do not form a continuous forest, but alternate in patches with open prairie. In this manner they are found scattered over the steppes of Ishimsk, Akmolinsk, Kurudzhinsk, and Barabinsk, and furnish fuel for the inhabitants, wood for their houses, and bark for the roofing.

The Mountain Woodlands belong in part to the Mountain zone, which extends along the mountains, especially their northern slopes, from the Tian-Shan east to the Stanovoi and Yablonoi ranges. Here the forest vegetation is varied; but conifers, such as the larch, pitch-pine, pine, and cedar, predominate, and would yield excellent timber, were they not in such inaccessible places.

From a scientific point of view, the forest zone of Siberia is of great interest, because of its marked difference from that of Russia.

"Of the trees spread all over European Russia, there disappear immediately on crossing the Ural: the oak, two species (*Quercus sessiliflora*, Im. and *Q. pedunculata*, Ehr.), the hazel (*Corylus avellana*, L.), the two elms (*Ulmus campestris*, L. and *U. pedunculata*, Fouq.), all species of maple (*Acer*), the ash (*Fraxinus excelsior*, L.), and finally, the apple tree (*Pyrus malus*, L.). The woods of the agricultural and forest regions of Siberia are composed of the conifers: the Siberian fir (*Abies sibirica*, Led.), passing from Siberia into northeastern Russia, and in Siberia itself reaching to Kamchatka, the oriental or Siberian pitch-pine (*Picea orientalis*, L.), also passing into the northern and northeastern part of European Russia, and through Siberia reaching the Kurile Islands; two species of larch, the Siberian (*Larix sibirica*, Led.), also passing into the northeastern part of European Russia and in Siberia spreading as far as Baikal, and the

dahur larch (*Larix dahurica*, *Trautv.*), a purely Siberian form, occurring in Western Siberia between Berezof and Obdorsk; the Siberian cedar (*Pinus cembra*, *L.*), scarcely crossing the Ural on the European side, but in Siberia spreading as far as Bering Sea and crossing into the northern part of America; finally, the common pine (*Pinus communis*, *L.*).” *

Within these thick forest growths, the flora is scanty, and consists of mosses and lichens, which cover the ground. On the edges of the forest zone, the aspen and birch appear, and become numerous in some areas of the cultivable land called steppes by the Russians. These Western Siberian plains thus partially covered with foliage trees are very extensive. The predominating species are:

“The common birch (*Betula alba*, *L.*), aspen (*Populus tremula*, *L.*), the abele (*Populus alba*, *L.*), occurring only in the southern part of the plain; both species of alder (*Alnus glutinosa*, *W.* and *A. incana*, *W.*), linden (*Tilia parvifolia*, *Ehrh.*), the last also confined to the southern part of the cultivated zone. To these lofty kinds must be added two kinds of rowan, the ordinary mountain ash (*Sorbus aucuparia*, *L.*) and the Siberian species (*Sorbus tomentosa*, *L.*); the common bird cherry (*Prunus padus*, *L.*) and also many sorts of willow (*salix*), of which more than fifteen European Russian species occur in the forest and agricultural zones of Siberia.” *

Within the forests of the forest zone, the herbaceous vegetation is very scant or entirely lacking, but in the openings and marshes, and along the river banks, it is luxuriant, and char-

* Siberia and the Great Siberian Railway. p. 29.

acterized by interesting local variations. The plants found here include

"some of the spearwort family, namely three varieties of *Thalictrum* (*T. petaloideum*, L., *T. rufinerve*, L., and *T. sparsiflorum*, Turcz.), two anemones (*Anemone sibirica*, L., and *Pulsatilla davurica*, Spr.), chickweed (*Caltha natans* Pall), *Isopyrum fumarioides*, L., two *Aquilegias* (*Aquilegia sibirica*, Lm., and *A. parviflora*, Led.), one variety of larkspur (*Delphinium grandiflorum*, L.), three kinds of aconites (*Aconitum volubile*, Pall., *A. villosum*, Rch., *A. Kusnetzovi*, Turcz.); some of the plants found here only grow within the borders of the Yakutsk frontier country, like *Delphinium crassicaule*, Led., and others, and American types like *Ranunculus Purshii*, Hook, and *R. affinis*, R. Br., and other numerous families of plants."*

3. *The Steppe Zone*.—The Ural Mountains, which form such a sharp division between the species of trees to be found in Russia and Siberia, make almost no change in the herbaceous vegetation. The low range of the Urals does not prevent the light seeds from Russia being carried over them by the wind to Siberia, where nearly similar soil and climatic conditions favor their growth.

"The traveler entering Siberia through Ekaterinburg or Zlatoust, crossing the whole Siberian plain as far as Tomsk and further to the Yenisei, is not struck with any difference in the herbaceous vegetation; very few western species disappear, though they sometimes change to eastern varieties, as for example, the pale yellow heads of the European crowfoot (*Trollius europeus*, L.) are replaced by the fiery orange of its Asiatic variety (*T. asiaticus*, L.). Very few oriental

* Siberia and the Great Siberian Railway. p. 47.

forms appear which do not occur in European Russia, or which only here and there cross its frontier, as for example, some anemones (*Anemone reflexa*, Steph., *A. altaica*, Fisch. and *A. pennsylvanica*, L.), one beautiful species of paeony (*Paeonia anomala* L.), a few *Cruciferae* (*Dentaria tenuifolia*, Led., *D. chorispora sibirica*, D. C., *D. hesperis Africa*, Poir.), one species of violet (*Viola uniflora*), among the *Caryophyllaceae*, *Lychnis sibirica*, L., among the *Compositae*, a few species of wormwood (*Artemisia desertorum*, Spr., *A. turczanoviana*, Bess.; *A. macrantha*, Led., *A. latifolia*, Led.), the eastern forms of gentians (*Gentiana auriculata*, Pall., *G. aquatica*, L., *G. halenia sibirica*, Borkh.), etc. But the general character of the herbaceous flora remains the same, the plants merely becoming somewhat more sappy and fresh and the flowers brighter colored than in European Russia." *

Over the Kirghiz Steppe the climate is very dry, the annual rainfall ranging from ten inches in the north to less than four inches in the south on the Aral Sea. For this reason, trees are very rare, and "only such shrubs as the wild cherry (*Cerasus chamaecerasus*) and the dwarf almond (*Amygdalus nana*), growing on the hilly slopes," are found. The black earth of the northern part is covered with feather grass (*Stipa pennata*), which is abundant in Southern Russia, and is very luxuriant here in the spring. Still further south, and bordering on the desert zone, a clay displaces the black soil, and the feather grass (*Stipa pennata*) is replaced by *Stipa capillata*. Here trees disappear entirely, "and, among the bushes along the banks of the rivers, willows and the pseudo-acacia, or Siberian pea tree (*Caragana microphyla*) are most prevalent. In the middle parts of the province [Turgai] the clayey soil is

* Siberia and the Great Siberian Railway. p. 28

completely clothed with wormwood (*Artemisia fragrans* and *A. monogyna*), with a few grassy plants on the banks of the rivers and lakes (*Lasiagrostis splendens*, *Alhagi camelorum* and *A. kirghisorum*, *Obione portulacoides*, *Halimodendrum argenteum*).* The above description of the flora of Turgai holds good for the greater part of the Kirghiz Steppe of which that province forms the center. On these steppes have been discovered one hundred and fifty new species, among them thirty species of *Astragalus* alone and ten *Salicornias* (*Salsolaecae*). Near the Aral Sea and Lake Balkash large areas of drifting sand are found which form the fringe of the Aral-Caspian desert region.

Under this zone should be considered the somewhat isolated region of the Minusinsk Steppe. This area is found near the headwaters of the Yenisei River, three or four hundred miles above Krasnoyarsk. In this region Mr. Nicolai Martianoff has made extensive collections which are kept in the Museum at Minusinsk. According to Kropotkin,

"the flora of the Minusinsk plains and of the steppes of the Abakan at once strikes the traveler by the variety and brilliancy of its forms. The meadows are covered with bright flowers scattered amid the common *Gramineae*, and in June and July they are adorned and perfumed by the *Polygala*, *Dianthus*, *Medicago*, *Lathyrus*, yellow sweet-scented lily, and scores of other flowers, mostly familiar in Europe, but attaining in Yeniseisk a larger size and greater brilliancy of color. The rich carpet of grass and flowers is overtopped by the tall white blossoms of *Archangelica* and *Spiraea Ulmaria*, and the blue

* Encyc. Brit., Art. Turgai.

masses of the tall *Veronica longifolia*. The meadows of the moister localities, surrounded by thickets of willow, poplar, wild cherry, and hawthorn, are still more attractive, on account of their wealth in anemones, violets, gentians, and so on, and the numerous creepers which festoon the trees and shrubs. M. Martianoff's lists enumerate a total of 760 flowering and 760 cryptogamic plants. Of the lower *Fungi* and parasitical *Myxomycetes* 1,300 species were noted, and out of the 823 species hitherto described by specialists no less than 124 have proved to be new."

4. *The Desert Zone*.—The desert zone includes a vast region east of the Caspian Sea, that extends to the Tian-Shan Mountains, which separate it from the Gobi Desert. In traveling south from Omsk, the gradation from the steppe to the desert flora is marked and interesting even to a casual non-botanical observer. The curious leafless, thickly spined forms of the desert flora as they appear on the desert sands make a lasting impression on the traveler. Through the section of the desiccated lakes there are found a remarkable number of salt plants such as *Chenopodiaceae* and *Salicorneae*. Of the former, Regel and Herder record *Camforosma ruthenica*, and *Salsola kali*, or saltwort, as found in salt soils; also *Suaeda salsa* and *Petrosinomia crassifolia* and *P. brachiata* on the dry Kirghiz Steppes; besides numerous other species growing along the river valleys. On the salt clay soil of the old lake beds, there are forests of tamarisk which brighten the monotony of the region.

5. *The Mountain Flora*.—The mountain flora of Siberia is very rich and varied, on account of the numerous high mountain ranges which skirt its southern boundary and extend en-

tirely across its eastern part. These are so deeply dissected by stream erosion that there are many isolated valleys where variations have arisen.

One of the most distinct of the mountain regions is that of the Altai. Here the flora, although it contains a few of the alpine plants of Europe, is peculiarly its own. Many of the new varieties, and even species, arise from the fact that the plants of the vast comparatively moist region of Western and Northern Asia, and those from the arid steppes and deserts of Central Asia, climbing these mountains, come into entirely different climatic conditions, where differentiation is greatly stimulated. On the northern slope, there is found an isolated high alpine vegetation, while on the southern slope the dry Asiatic steppe flora, rising into more favorable conditions, has differentiated into a whole series of original high steppe varieties. To such forms belong, for example, the peculiar species of *Astragalus* and *Oxytropis* of the Altaic meadows of the alpine zone.

"Among the shrubs characteristic of the subalpine zone of the Altai may be noticed: a few species of acacia (*Caragano microphylla*, Zam., *C. bungei*, Led., *C. pygmaea*, DC., *C. spinosa*, DC., *C. tragacanthoides*, Poir.), two dog roses (*Rosa platyacantha*, Schr. and *R. Gebleriana*, Schr.), the galten tree (*Cotoneaster uniflora*, Bge.), some species of currant (*Ribes aciculare*, Sm., *R. saxatile*, Pall., *R. cuneatum*, Kar., *R. heterotrichum*, Moq., *R. procumbens*, Pall.), two species of tamarisk (*Tamariscineae*), (*myricaria alopecuroides*, Sch., and *M. Daurica*, Ehr.), three honeysuckles (*Lonicera humilis*, Kar., *L. hispida*, L. and *L. bungeana*, Led.), one species of azalea (*Osmothamnus pal-*

lidus, DC.) and two rhododendra (*Rhododendron chrysanthum*, Pall., and *R. davuricum*, L.); among acicular-leaved shrubs, *Ephedra stenosperma*, Schr., and *E. intermedia*, Schr., *Juniperus pseudosabina*, Fisch. and *J. davurica*, Pall., and two kinds of birch (*Betula microphylla*, Bge., and *B. tortuosa*, Led.).

"Much more characteristic is the herbaceous vegetation of the alpine and subalpine meadows and slopes, which enchant the eye with the richness and brilliancy of their flowers. The following may be indicated as among the species most characteristic for the Altai Sayan mountainous system, a few beautiful anemones (*Anemone umbrosa*, Mey., *A. Fischeriana*, D. C. and *A. pulsatilla bungeana*, Mey.), peculiar kinds of crowfoot (*Ranunculus altaicus*, Lxm., *R. longicaulis*, *pulchellus*, *natans*, *lasiocarpus*, *propinquus*, *grandifolius*, Mey., and the exceptionally interesting *Oxygraphis glacialis*, Bge., and *Callianthemum rutaefolium*, Mey.), a *Ranunculus* with pale lilac flowers (*Hegemone lilacina*, Bge.), larkspurs (*Delphinium laxiflorum* and *D. dictyocarpum*, DC.), three fumitories (*Corydalis nobilis*, Pers., *C. stricta*, Pers. and *C. inconspicua*, Bge.), as many as thirty altaic species of Cruciferae, belonging to the high alpine zone (of the genera *Mathiola*, *Arabis*, *Parrya*, *Macropodium*, *Psilotrichum*, *Draba*, *Holargidium*, *Chorispora*, *Dontostemon*, *Braya*, *Eutrema*, *Hutchinsia*), charming species of violets (*Viola altaica*, Pall., *V. macrocarpa*, Bge., *V. imberbis*, Led., and *V. acuminata*, Led.), about fifteen peculiar species of *Coryophyllaceae* and *Stellariae*, altaic varieties of Flata (*Linum violaceum*, Bge.), Saint John's worts (*Hypericum gebleri*, Bge.), some forty beautiful variegated sorts of *Leguminosae*, among which especially prominent are numerous species of *Astragalus* (*Astragalus* and *Oxytropis*), whose extensive family climbs from the Central Asiatic steppes to the eternal snows of the Asiatic mountain ranges. Next follow the quaint, high alpine forms of *Rosaceae* (*Sibbaldia adpressa*, Bge., *Dryandanthe bungeana*, Led., *Chamaerodon altaica*, Bge., *Potentilla Al-*

taica, Bge., *Comarum salessowi*, Bge.). Further there are a few characteristic saxifrages, among which in particular the so-called Chagyr tea (*Saxifraga crassifolia*, L.), the large leaves of which serve as a substitute for tea. There are some twenty species of Altai *Compositae*, among them several species of *Saussurea* (*S. Pygmaea*, Spr., *S. Pycnocephala*, Led., *S. latifolia*, Led., *S. acuminata*, Turcz., *S. foliosa*, Led.). Finally, the *Primulaceae* largely contribute to the adornment of the alpine meadows of the Altai (*Primula longiscapa*, Led.), charming blue and yellow gentians (*Gentiana atrata*, Bge., *G. azurea*, Bge., *G. tenuis*, Bge., *G. altaica*, Pall., *G. karelini*, Fries., *G. frigida*, Haenk., *G. macrophylla*, Pall.), irises (*Iris glaucescens*, Bge., *I. bloudowi*, Led. and *I. tigridia*, Bge.) and some bulbous plants: *Tulipa altaica*, Pall., *Lilium tenuifolium*, Fisch., and *L. spectabile*, Link., *Fritillaria verticillata*, W., etc." *

The Sayan Mountains, to the east of the Altai, have a flora quite similar to the latter, but with some marked peculiarities. There are some polar forms not met with in Europe or Western Siberia, "but peculiar to the arctic zone of Eastern Siberia and America." Many of the Altai species disappear, while others, common to the Stanovoi and even the Tian-Shan, appear. "To the latter form belongs the prickly shrub with gray foliage and yellow flowers, characteristic of the alpine zone, known among the Turk tribes under the name of the camel's tail, *Tinek-urruk* (*Caragana jubata*, Poir)." A number of Altai-Sayan mountain forms have descended from these mountains into the lowlands east of the Yenisei River. Among these are some of the *Leguminosae* ("*Oxytropis muricata*,

* Siberia and the Great Siberian Railway. pp. 30-31.

DC., *O. brevirostre*, DC., *O. ammophila*, Turcz., *O. grandistore*, DC., *O. lencantha*, Pers., *O. caepitosa*, Pers., and *O. ampullata*, Pers.”)

The mountains to the east of the Sayan range are mostly covered with thick forests described earlier in the chapter under the Forest Zone.

“The vegetable covering of Transbaikalia reflects all the minutest features of its climatic peculiarities: in that half of the country which is situated between the northwest slope of the Yablonoi range and the Baikal Lake, the flora still bears completely the character of the mountain flora of the extremity of the Altai-Sayan system. Among shrubs this flora includes rhododendrons (*Rhododendron chrysanthum*, Pall. and *R. dahuricum*, Pall.), the Siberian barberry (*Berberis sibirica*, Pall.), species of meadow-sweet (*Spiraea trilobata*, L., *S. alpina*, Pall., *S. digitata*, W.), clothing the mountain steeps with their snow-white flowers, a species of tamarisk (*Myricaria davurica*, Ehr.), species of currant (*Ribes fragrans*, Pall., and *R. procumbens*, Pall.). Alpine herbs exclusively peculiar to the Altai-Sayan system grow in profusion in Transbaikalia; but on crossing to the other side of the Yablonoi range the flora becomes greatly changed, and plants appear belonging to the far east of the temperate zone of the Asiatic continent. Thus, of the woody races, trees are here to be met with belonging to those generally thriving in Siberia from the very Ural, the oak (*Quercus mongolica*, Fisch.), the elm (*Ulmus campestris*, L., var. *pumila*, L.), the hazel (*Corylus heterophylla*, Fisch.) and the wild apple (*Pyrus baccata*, L.).

“It is remarkable that but few of the shrubs first appearing beyond Lake Baikal as for example the Daur blackthorn (*Rhamnus davurica*, Pall.), of the Leguminosae *Lespedeza juncea*, Pers., one species of meadow-sweet (*Spiraea angustifolia*, Turcz.), one species of currant

(*Ribes diacantha*, Pall.), the Daur snow-ball tree (*Viburnum davuricum*, Pall.), a small shrub belonging to the spurge family (*Geblera suffruticosa*, Fisch.) and one of the low-growing birches (*Betula fruticosa*, Pall.) belong to the Amur flora. The rest are peculiar to the so-called Daur flora and common to Transbaikalia, and the neighboring Mongolia. There are two kinds of traveler's joy (*Clematis davurica*, Pall., and *Atragene macropetala*, Led.), one black-thorn (*Rhamnus erythro-xylon*, Pall.), among the *Leguminosae*, *Lespedeza trichocarpa*, Pers., and *Hedysarum fruticosum*, L., among the *Rosaceae*, the local wild almond (*Amygdalus pedunculata*, Pall.), the wild apricot, widely spread on the mountain sides (*Prunus sibirica*, L.), a species of dog-rose (*Rosa alpina*, L.), a gaiter-tree (*Cotoneaster acutifolia*, Lindl.), the shrubby *Potentilla glabra*, L., a species of tamarisk (*Myricaria longifolia*, Ehr.), two species of currant (*Ribes triste*, Pall. and *R. pulchellum*, Turcz.), honeysuckle (*Lonicera chrysantha*, Turcz.), two species of shrubby birch (*Betula divaricata*, Led., and *B. Gmelini*, Bge.) and the willows (the *Salix berberifolia*, Pers., and *S. divaricata*, Pall.), the remaining willows found here belonging to the European kinds.

"To the kinds disseminated over the whole of Siberia belong not only all the coniferous trees of Transbaikalia, namely, the pine (*Pinus sylvestris*, L.), the Siberian and Daur larches (*Larix sibirica*, Led. and *L. davurica*, Fisch.), the Siberian fir (*Abies sibirica*, Led.), the Siberian pitch-pine (*Picea orientalis*, L.) and the cedar (*Pinus cembra*, L.), but also many of the deciduous trees, the white and Daur birches (*Betula alba*, L., and *B. davurica*), the aspen (*Populus tremula*, L.), etc. The fine-scented poplar (*Populus suaveolens*, Fisch.) is met with on both sides of Lake Baikal.

"As for the herbaceous flora, of 112 species of them, first met with beyond Baikal, only forty-six pass over to the Amur, the rest belonging to the local so-called Daur flora, which serves as the connecting

link between Siberia and Mongolia, whither indeed many plants cross over. Among the latter are, for example, among the crowfoot family (*Ranunculaceae*), two species of hellebore (*Eranthis sibirica*, DC., and *E. uncinata*, Turcz.) and *Actinospora davurica*, Turcz.; five *Cruciferae* (*Draba mongolica*, Turcz., *Tetrapoma barbareaefolium*, Turcz., *Dontostamon eglandulosus*, Led., and *oblongifolius*, Led.); of the *Leguminosae* ten species of *Oxytropis* (a genus characteristic of mountain steppes of Central Asia, entirely unknown on the Amur), two *Astragali*; of the rose family (*Chamaerhodos grandiflora*, Led., and *C. trifida*, Led.); of the saxifrages, (*Saxifraga multiflora*, Led.); six *Umbelliferae*, six *Compositae*; of the *corolliflorae*, *Plingicula spathulata*, Led.; three species of bindweeds (*Ipomea sibirica*, Pers., *Calystegia pellita*, Led., and *C. subvolubilis*, Led.); four *Borraginaceae*, three *scrophulariaceae*, three *Labiatae* and three species of *Staticeae* characteristic of the salt steppe; of the family of *Monochlamydeae*, two species of rhubarb (*Rheum undulatum*, L., and *R. campestre*, L.), one of sorrel (*Rumex Gmelini*, Turcz.); *passerina* *Stellern*, Wickstr., and a spurge (*Euphorbia Pallasii*, Turcz.); of the monocotyledons, *Sparganium longifolium*, Turcz.; two orchids (*Orchis salina*, Turcz., *Gymnadenia pauciflora*, Lindl.), *Iris ventricosa*, Pall., *Pardanthus dichotomus*, Led., *Polygonatum sibiricum*, Led., two sedges and two grasses." *

6. *The Flora of the Pacific Border*.—There remain still to be considered the Amur and the Usuri, and the Kamchatka floral divisions. The different areas and zones so far described have had so many points of similarity that they might be considered as a whole. The remaining divisions have an entirely different floral relationship. Here there is a mixing of the flora of Transbaikalia, China, Japan, Kamchatka, and America.

* Siberia and the Great Siberian Railway. pp. 57-58.

"The vegetative covering of the Amur country is luxuriant and peculiar, and displays a great difference from the floras of the other parts of Siberia. Even the woody vegetation exhibits striking differences from the similar vegetation of not only Siberia but also of Transbaikalia. With the ordinary Siberian races of conifers are here associated the Manchurian cedar (*Pinus mandshurica*, Rupr.), the ayan pitch-pine (*Picea ajanensis*, Fisch.), and an ally of the conifers, the yew (*Taxus baccata*, L.), peculiar to the mountains of the Caucasus. The yew nowhere else is to be met with in Siberia, and shows by its appearance on the lower Amur the nearness of the sea. The flora of the foliage trees and shrubs is both richer and more varied, here going to meet the beneficent marine influences of the Eastern Ocean. The lime genus is here represented by two peculiarly eastern forms, *Tilia cordata*, Mill., and *T. mandshurica*, Rupr. et Max. The maple, a stranger to the whole of Siberia, has here four representatives, of which the *Acer mono*, Max., is a characteristic local kind, the *A. ginnala*, Max., a species closely allied to the eastern European *A. tataricum*, L., and the Semirechensk *A. Semenowii*, Reg.; the *A. tegmentosum*, Maxim., bears a resemblance to the American kind (*A. pennsylvanicum*, L.); finally, the *A. spicatum*, Lam., is undoubtedly an American variety. The apple, already appearing in Transbaikalia in the shape of a very small fruited variety (*pyrus baccata*), is here represented by a beautiful new species (*P. Usuriensis*, Max.), and the bird cherry by two local varieties (*Prunus Maackii*, Rupr., and *P. Maximowiczii*, Rupr.). Two local species of walnut embellish the forest of the Amur (*Juglans mandshurica*, Max., and *J. stenocarpa*, Max.), as also the local species of the ash unknown to the whole of Siberia (*Fraxinus mandshurica*, Rupr. With the European and Transbaikalian varieties of the elm is associated the local *Ulmus montana*, Winckl. Further alongside the species of hazel already appearing in Transbaikalia (*Corylus heterophylla*, Fisch.) is found a new species (*Corylus mand-*

shurica, Max.): Finally, among the birches reappear a Kamchatka variety (*Betula Ermanni*, Cham.) and one local timber tree (*B. costata*, Trautv.). The third local variety of birch (*B. Middendorffii*, Trautv.) is a shrub. The charming little tree of the Amur country with a palmy crown (*Dimorphanthus mandshuricus*, Rupr.) is far removed from the character of the Siberian trees. It belongs to the family of *Araliaceae*, which loves a moist climate and is nowhere to be met with in Siberia. Not less remarkable is the cork tree of this country (*Phellodendron amurense*, Rupr.), belonging to the family of *Zanthoxyleae* nowhere to be met with in the whole of Russia.

"The shrubs of the Amur country are still more peculiar than the trees. Not less than twenty-four varieties of shrubs here met with are entirely new for any one arriving from Siberia and Transbaikalia. Of these, three climbers are the lianas of the woods here. They are first of all, a beautiful plant belonging to the rare family of *Schisandraceae* with pale rose-scented flowers and red berries (*Maximoviozia Chinensis*, Rupr.), spread from Northern China through Manchuria to the Amur country; a species of vine, very slightly distinguished from the true vine (*Vitis amurensis*, Rupr.); and finally the wild vine (*Cissus brevipedunculata*, Max.). The species of clematis appearing here for the first time (*Clematis mandshurica*, Rupr., and *C. aethusaefolia*, Turcz.) belong to the non-climbing shrubby varieties of this genus. Of the two species of local barberry one is also peculiar to Northern China (*Berberis sinensis*, Desf.); another, local (*B. amurensis*). The very curious shrub of the Amur country, *Actinidia komoliktia*, Rupr., covered with large white-scented flowers, has not yet found a strictly definite position in systematic botany, it being now referred to one, now to another, of the exotic families. Of the four local varieties of spindle tree there is one Japanese (*Euonymus alatus*, Th.), and three local (*E. pauciflorus*, Max., *E. Maackii*, Rupr., and

E. macropterus, Rupr.). Of the *Leguminosae* the small shrub found here (*Lespedeza stipulacea*, Max.), also grows in the environs of Pekin. Of the rose family, the local species of cherry (*Prunus glandulifolia*, Rupr.) and meadow sweet (*Spiraea Amurensis*, Max.) are shrubs. Two local species belonging to the same genus as our so-called garden jasmine (*Philadelphus*), are a conspicuous adornment of the forests (*Philadelphus tenuifolius*, Rupr., and *P. Schrenkii*, Rupr.). The beautiful local shrub of the same family (*Deutsia parviflora*, Bge.) is a Chinese plant, spread by cultivation. To the family of *Araliaceae* not to be met with in Siberia belong two shrubs common to this flora and that of Northern China (*Panax sessiliflorum*, Rupr. and *Eleutherococcus senticosus*, Max.). Of the honeysuckles, there are here one Chinese species (*Lonicera chrysantha*, Turcz.) and two local (*L. Maackii*, Rupr. and *L. Maximowiczii*, Rupr.). Common to Northern China is a species of lilac occurring here on the skirts of the woods with somewhat minute whitish flowers (*Syringa amurensis*, Rupr.). A variety of laurel, met with on the lower Amur is that called after Kamchatka (*Daphne kamtschatica*, Max.).

“Among the herbs of the Amur country not less than 110 species are exclusively peculiar to this region, the rest are common to the Amur with China, Japan, Kamchatka and even America, but especially with Transbaikalia and Siberia. The whole flora of the Amur has 340 plants common with that of European Russia, that is, thirty-eight per cent, while with Transbaikalia it has 527, or more than fifty-eight per cent.” *

The Usuri flora is very similar to that of the Amur, but contains a higher per cent of European Russian forms than the Amur region, it being forty-seven instead of thirty-eight per cent. This is due to a greater similarity of climate.

* Siberia and the Great Siberian Railway. pp. 62-63.

"The species of trees are identical with those in the Amur country. Only one new tree appears, a hornbeam (*Carpinus cordata*, Bl.) and two shrubs, the wild vine crossing from North China (*Cissus humulifolia*, Bge.), and the common European barberry (*Berberis vulgaris*, L.). Only a little over eighty species of herbaceous plants are found in the Usuri country and not met with in Amur, among them being species common to North China, Japan and America. Only seventeen local plants are known which have been found nowhere except in Usuria. Among them is the celebrated ginseng (*Panax ginseng*, Reg.), whose root is so prized as a remedy by the Chinese. Probably many of these plants will be subsequently found in the Amur country also, but some of them bear undoubtedly a more southern character. To the latter are to be referred, from the pea family, the beautiful climbing *Glycine usuriensis*, Reg., of the exotic family *Pontederiaceae*, the very showy marsh plant (*Monochoria Korsakovii*, Reg.); of the family of *Eriocaulaceae*, *Eriocaulon usuriense*; finally, of the ferns with a sub-tropical appearance, *Pleopeltis usuriensis*, Reg. The flora of the Usuri country has many forms common to North America; twenty-five per cent of the whole Usuri flora is met with in North America, but of course the majority of these species belong to those equally existent over the whole northern zone alike of the Old and the New World, and only thirty-two species entirely foreign to European Russia, cross from America, fourteen through the Yakutsk region and eighteen direct."

The flora of Kamchatka and the region just northwest of the Sea of Okhotsk, as has been mentioned before, belongs to quite a different zone from any of the others described. Here there is a mingling of species from Manchuria and the Amur with those from North America. The flora bears a greater

* Siberia and the Great Siberian Railway. pp. 68-69

resemblance to that of Eastern than to Western North America, or to Siberia or even Europe,—a fact which Professor Asa Gray brought out so clearly for the whole east coast of Asia, in his celebrated essay on the “Flora of Japan.”

With Professor Gray's generalization, that the floras of North America and Eastern Asia mingled by crossing Bering Strait, it will be interesting to note some of the similarities between the floras of Kamchatka and Okhotsk provinces and North America. The list of Kamchatkan plants used in this comparison is taken from a Russian Government report, 1900, on the provinces of Okhotsk and Kamchatka.

This list contains 746 species of phænogamous or flowering plants, 173 identical species of which are common to North America, that is, twenty-three per cent are found in North America. Many of these species are distributed universally through the North Temperate Zone, and twenty-one are known to have been introduced into America from Europe, but have become naturalized. If now we compare the flora of Manchuria, using the list published in the Russian Government report on Manchuria for 1897, with that of Kamchatka and Okhotsk, we find that there are 193 identical species common to both, that is, nearly twenty-six per cent, only five per cent more than that with North America. Of the 173 species common to North America and the Provinces of Okhotsk and Kamchatka, seventy-seven are also found in Manchuria.

Out of the 284 genera found in Okhotsk and Kamchatka there are sixty-two genera not to be found in North America. This number will probably be increased when the Kamchatkan

flora has been better studied, for the region is so inaccessible that the lists at present must be quite incomplete. Under the genera not found in North America, there are, of the *Ranunculaceae* two genera,—*Atragene* with two species, and *Pulsatilla* with three species; of the *Fumariaceae* one genus—*Dielytra*; of the *Cruciferae* five genera,—*Parrya* with three species, *Braya*, *Cochlearia* with three species, *Tetrapoma* with two species, and *Dontostemon*; of the *Sileneae* one genus—*Sypsophila*; of the *Alsiniae* four genera,—*Honkeneja*, *Alsine* with five species and nine varieties, *Möhringia* with four varieties of its species *lateriflora*, and *merckia*; of the *Papillionaceae* three genera,—*Caragana*, *Pisum*, and *Phaca* with two species; of the *Rosaceae* three genera,—*Sieversia* with two species, *Sanguisorba* with three species, and *Comarum*; of the *Portulacaceae* one genus,—*Montia*; of the *Crassulaceae* one genus,—*Umbilicus*; of the *Saxifragaceae* one genus,—*Leptarrhen*; of the *Umbelliferae* six genera,—*Libanotis*, *Tilingia*, *Physolophium*, *Pleurospermum*, *Pachypleurum*, and *Angelophyllum*; of the *Caprifoliaceae* one genus,—*Calyptrostigma*; of the *Valerianeae* one genus,—*Patrinia*; of the *Compositae* ten genera,—*Nordosmia* with three species, *Galatella*, *Calimeris*, *Ligularia*, *Sausurea* with six species, *Scorzonera*, *Chorisis*, *Inthybus*, *Berinia* with two species, and *Pilosella*; of the *Vaccineae* one genus,—*Oxycoccus*; of the *Primulaceae* one genus,—*Cortusa*; of the *Gentianeae* two genera,—*Stellera*, and *Swertia* with two species; of the *Borragineae* one genus,—*Eritrichium* with seven species; of the *Selaginaceae* one genus,—*Gymnandra*; of the *Polygoneae* one genus,—*Rheum*; of the *Betulaceae* one

genus,—*Alnaster*; of the *Aroideae* one genus,—*Simplocarpus*; of the *Orchidaceae* five genera,—*Gymnadenia*, *Parularia*, *Platanthera* with five species, *Peristylis* with two species, and *Neottia*; of the *Smilacaceae* two genera,—*Paris* with two species, and *Kruhsea*, of the *Liliaceae* three genera,—*Lloydia*, *Gagea*, and *Fritillaria*; of the *Melanthaceae* three genera,—*Acedilanthus*, *Anticlea*, and *Tofieldia* with three species; of the *Gramineae* three genera,—*Coeleria*, *Limnas*, and *Digraphis*.

The number of cryptogamous plants given in the Okhotsk-Kamchatkan list is only thirty-four, of which seven are *Equisetaceae*; all of them found in North America; nine are *Lycopodiaceae*, six of which are found in North America; eighteen *Filices*, ten of which are found in North America. All of these with two or three exceptions are common in Europe.

The following list gives the plants common to the Okhotsk-Kamchatkan region and North America, those marked with a star (*) are common to Manchuria also.

Anemone pennsylvanica, L.	Dicentra lachenaliaeflora,
*A. nemorosa, L.	Ldb.
A. parviflora, Mich.	Nasturcium palustre, Leyss.
Ranunculus Flammula, L.	*Barbarea vulgaris, R. Br.
R. Cymbalariae, Purch.	*Arabis hirsuta, Scop.
*R. repens, L.	Cardamine bellidifolia, L.
Caltha palustris, L.	C. pratensis, L.
Coptis trifolia, Salsb.	Draba incana, L.
Actaea spicata, L.	*D. nemorosa, L.
Chelidonium majus, L.	*Thlaspi arvense, L.

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| * <i>Capsella Bursa pastoris</i> , L. | <i>G. macrophyllum</i> , Willd. |
| * <i>Sisymbrium Sophia</i> , L. | <i>Potentilla norvegica</i> , L. |
| * <i>Erysimum cheiranthoides</i> , L. | <i>P. Anserina</i> , L. |
| <i>Viola palustris</i> , L. | * <i>P. fruticosa</i> , L. |
| <i>V. blanda</i> , Hook. | * <i>Fragaria vesca</i> , L. |
| * <i>V. canina</i> , L. | <i>Pyrus sambucifolia</i> , Cham. et |
| <i>Drosera rotundifolia</i> , L. | Schlecht. |
| * <i>Stellaria media</i> , Willd. | * <i>Epilobium angustifolium</i> , L. |
| * <i>S. borealis</i> , MB. | <i>Hippuris vulgaris</i> , L. |
| <i>S. humifusa</i> , Rot. | <i>Claytonia virginica</i> , L. |
| * <i>S. longifolia</i> , Muhl. | <i>Sedum Rhodiola</i> , DC. |
| * <i>S. longipes</i> , Gold. | * <i>Ribes rubrum</i> , L. |
| <i>Cerastium vulgatum</i> , L. | <i>Saxifraga oppositifolia</i> , L. |
| * <i>C. arvense</i> , L. | * <i>Chrysosplenium alternifolia</i> , |
| <i>Linum perenne</i> , L. | L. |
| * <i>Geranium sibiricum</i> , L. | <i>Mitella nuda</i> , L. |
| * <i>Oxalis Acetosella</i> , L. | <i>Ligusticum scoticum</i> , L. |
| <i>Trifolium medium</i> , L. | <i>Coelopleurum Gmelini</i> , Ldb. |
| <i>T. pratense</i> , L. | <i>Carum carui</i> , L. |
| <i>Oxytropis campestris</i> , DC. | <i>Cornus Canadensis</i> , L. |
| <i>Astragalus alpinus</i> , L. | * <i>Adoxa Moschatellina</i> , L. |
| * <i>Vicia cracca</i> , L. | * <i>Sambucus racemosa</i> , L. |
| * <i>Lathyrus palustris</i> , L. | * <i>Linnea borealis</i> , L. |
| <i>L. pratensis</i> , L. | * <i>Galium Aparine</i> , L. |
| * <i>Spiraea betulifolia</i> , L. | <i>G. trifidum</i> , L. |
| * <i>S. salicifolia</i> , L. | * <i>G. verum</i> , L. |
| * <i>Geum strictum</i> , Ait. | * <i>Erigeron acris</i> , L. |

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| Solidago Virgaurea, L. | Samolus Valerandi, L. |
| *Achillea millefolium, L. | Gentiana Amarella, L. |
| A. Ptarmica, L. | *Menyanthes trifoliata, L. |
| Matricaria discoidea, DC. | *Polemonium coeruleum, L. |
| Tanacetum vulgare, L. | *Mertensia maritima, G. Don. |
| Artemisia biennis, Willd. | *Echinosperrnum L a p p u l a, |
| A. Stelleriana, Bess. | Lehm. |
| *Gnaphalium uliginosum, L. | *E. deflexum, Lehm. |
| *Senecio pseudo-Arnica, Less. | Limostella aquatica, L. |
| *Picris hieracioides, L. | Veronica Anagallis, L. |
| *Taraxacum officinale, Wigg. | V. serpyllifolia, L. |
| Crepis tectorum, L. | Castilleja pallida, Kunt. |
| *Vaccinium Vitis-Idaea, L. | *Euphrasia officinalis, L. |
| V. uliginosum, L. | *Mentha arvensis, L. |
| Arctostaphylos alpina, Sprgl. | *Thymus Serpyllum, L. |
| A. uva ursi, Sprgl. | *Nepeta Glechoma, Benth. |
| Andromeda polifolia, L. | Scutellaria galericulata, L. |
| Phyllodoce taxifolia, Salsb. | Galeopsis Tetrahit, L. |
| Loiseuria procumbens, Desv. | *Plantago major, L. |
| *Ledum palustre, L. | *Rumex acetosa, L. |
| *Pyrola rotundifolia, L. | *Polygonum Bistorta, L. |
| P. minor, L. | *P. viviparum, L. |
| P. secunda, L. | *P. aviculare, L. |
| *Moneses grandiflora, Salsb. | P. convolvulus, L. |
| *Utricularia intermedia, Hayne. | Empetrum nigrum, L. |
| Primula farinosa, L. | Salix phylicifolia, L. |
| *Lysimachia thyrsiflora, L. | *S. myrtilloides, L. |

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| * <i>Populus tremula</i> , L. | <i>Juncus balticus</i> , Dethar. |
| * <i>P. alba</i> , L. | <i>J. filiformis</i> , L. |
| * <i>Humulus Lupulus</i> , Ldb. | <i>J. articulatus</i> , L. |
| * <i>Urtica dioica</i> , L. | <i>Eriophorum vaginatum</i> , L. |
| * <i>Alnus incana</i> , Willd. | <i>Carex alpina</i> , Sw. |
| <i>Myrica Gale</i> , L. | <i>C. vulgaris</i> , Fries. |
| * <i>Juniperus communis</i> , L. | * <i>C. stenophylla</i> , Wahl. |
| * <i>Chenopodium album</i> , L. | <i>C. rariflora</i> , Smit. |
| <i>Atriplex patula</i> , L. | * <i>Elymus mollis</i> , Trin. |
| <i>Sparganium simplex</i> , Huds. | <i>Festuca ovina</i> , L. |
| <i>Acorus calamus</i> , L. | <i>Poa laxa</i> , Henke. |
| <i>Zostera marina</i> , L. | * <i>P. pratensis</i> , L. |
| <i>Potamogeton praelongus</i> ,
Wulf. | <i>P. compressa</i> , L. |
| <i>P. perfoliatus</i> , L. | <i>P. serotina</i> , Ehrh. |
| <i>Triglochin palustris</i> , L. | * <i>P. nemoralis</i> , L. |
| <i>Alisma plantago</i> , L. | <i>P. annua</i> , L. |
| <i>Corallorhiza innata</i> , R. Br. | * <i>Hierochloa borealis</i> , R. et
Sch. |
| * <i>Microstylis monophylla</i> ,
Lindl. | <i>H. alpina</i> , R. et Sch. |
| <i>Calypso borealis</i> , Salisb. | <i>Deschampsia caespitosa</i> , P.
Bea. |
| <i>Streptopus amplexifolius</i> ,
DC. | <i>Calamagrostis Langsdorffii</i> ,
Trin. |
| <i>Smilacina trifolia</i> , Desv. | <i>Agrostis canina</i> , L. |
| <i>Allium Schoenoprasum</i> , L. | <i>Trisetum subspicatum</i> ,
Beanv. |
| * <i>Veratrum viride</i> , Ait. | * <i>Phleum alpinum</i> , L. |
| <i>Luzula spadicea</i> . | |
| * <i>L. campestris</i> , DC. | |

Cryptogamia

* <i>Equisetum pratense</i> , Chrk.	<i>Botrychium Lunaria</i> , Sw.
<i>E. limosum</i> , L.	<i>Polypodium vulgare</i> , L.
* <i>E. silvaticum</i> , L.	* <i>Woodsia ilvensis</i> , R. Br.
<i>E. variegatum</i> , Schleich.	<i>W. glabella</i> , R. Br.
<i>E. scirpoides</i> , Mich.	<i>Aspidum fragrans</i> , Sw.
* <i>E. arvense</i> , L.	* <i>Cystopteris fragilis</i> , Bernh.
* <i>E. hyemale</i> , L.	* <i>Asplenium Filix-foemina</i> ,
<i>Lycopodium Selago</i> , L.	Bernh.
* <i>L. annotinum</i> , L.	* <i>Pteris aquilina</i> , L.
* <i>L. alpinum</i> , L.	* <i>Adiantum pedatum</i> , L.
* <i>L. complanatum</i> , L.	<i>Struthiopteris germanica</i> ,
* <i>L. clavatum</i> , L.	Willd.
<i>Selaginella rupestris</i> , Spring.	

Fauna

The boundary lines so pronounced in the flora of Asiatic Russia are less distinct in the fauna, especially for the higher forms. However, among the invertebrates there is a marked change noted between those of Western Siberia and those of Transbaikalia. The insects of the steppes of Western Siberia are very similar to those of European Russia, but in many places, as on the Altai Mountains, show great variations. In Transbaikalia there is a very decided change. The fauna of Turkestan from its comparatively isolated position, as regards Siberia proper, deserves separate mention. For convenience we will consider, first the fauna of the Arctic Tundra; second,

that of Western Siberia; third, that of Transbaikalia and Eastern Siberia; and fourth, that of Turkestan.

The Birds

Before taking these up, however, the birds might be spoken of in a general way, for their great migrations take them from season to season into widely separated regions, from the Arctic coast to the forests and even the steppes of Siberia.

"The birds of prey, which are found as far as the Taimur peninsula, are: one of the eagle tribe, probably *Aquila albicilla*, Bris., and a buzzard (*Buteo lagopus*), two sorts of falcons (*Falco gyfalcon*, L., *Falco tinnuncula*, St.), and some bats (*Stryx brachyotus*, Forst., *Stryx noctea*, L., *Stryx funerea*, Lath.). The small birds (*Passeres*) which nest far north in Siberia, are some varieties of larks (*Alauda alpestris*, L., *Plectroph nivalis*, L., *Plectroph lapponica*, *Emberhiza polaris*, Mid., *Fringilla linaria*, L., *Parus sibiricus*, Pm., *Motacilla alba*, L.). The fowls which are found partly in the polar zone and especially in the forest zone are particularly the *Lagopus albus*, L., and *Lagopus alpinus*, Nilss., the heathcock (*Tetrao urogallus*, L., *Tetrao tetrix*, L. and *Tetrao bonasia*, L.). There are numerous long-legged birds in Siberia, but principally of the same kinds as those in Europe. Siberia is, however, particularly rich in water-fowls, which nest in countless numbers on the shores of the Arctic Ocean, and also on the banks of the rivers and lakes. On Lake Baikal the gulls are so numerous that the crags and rocks overhanging it are covered with a thick layer of guano, which for a long time will serve as manure for the future generations of Siberian farmers. One of the many remarkable phenomena of Lake Baikal is the existence of a species of seal (*Phoca baicalensis*), in the water of this inland sea." *

* Siberia and the Great Siberian Railway. pp. 41-42.

Kropotkin observes that:

"no less than 285 species [of birds] have been observed in Siberia, but of these forty-five only are absent from Europe. In Southeast Siberia we find forty-three new species belonging to the North Manchurian or Amur fauna; and in Southeast Transbaikalia, on the borders of the Gobi Steppe, only 103 species were found by Radde, among which the most numerous are migratory birds and the birds of prey which pursue them."

Arctic Fauna

The Arctic Tundra is often visited along its ocean border by the white polar bear (*Ursus maritimus*, L.). They come on floating ice from their native islands of the Arctic Ocean, and land on the coast, from which they never wander any great distance. They have been known to go up the Gulf of Yenisei as far as Tolsty Nos, the most northern settlement on the Gulf.

"Next come those arctic wild animals which almost exclusively inhabit the polar tundra region: the arctic fox (*Canis lagopus*, L.), found in the Taimursk peninsula under 75° northern latitude, and the small striped or Obi lemmings (*Myodes torquatus* and *Myodes Obensis*). There was formerly another large animal contemporaneous with mankind existing in the polar tundra region corresponding to the musk ox (*Bos moschatus*), which is found in the polar regions of America, but has now entirely disappeared; this Siberian ox (*Bos pallasii*) was distinct from the American variety, but is only known by the skulls and bones found in the Taimursk tundras. Finally, as characteristic animals of the tundras, the northern hare (*Lepus variabilis*, Pall.) and the reindeer (*Cervus tarandus*, L.) may be mentioned, although they

spread far down into the forest zone. The latter is found in the mountainous parts of South Siberia; on the Urals it goes down south as far as 52° northern latitude, on the Altai to 49°, on the Sayan and Stanovoi chain to 53°, and in the Amur region it reaches the mouth of the Usuri under 49° north latitude." *

Of the numerous birds which visit the Arctic Tundra for breeding, there are only five land-birds which make it their permanent home, "the ptarmigan (*Lagopus alpinus*), the snow-bunting, the Icelandic falcon, the snow-owl, and the raven."

The life in the Arctic Ocean bordering on the Arctic Littoral is rich in rare types. The Kara Sea furnishes many beautiful and peculiar types of *Umbellularia*, *Elpidia*, *Alecto*, and many kinds of asterids, besides a rich flora of Algae.

From the collections of the *Vega* Expedition, gathered near Beli Ostrov, the most remarkable, according to Stuxberg, are "a species of *Mysis*, *Diastylis Rathkei*, Kr., *Idothea entomon*, Lin., *Idothea Sabinei*, Kr., two species of Lysian assida, *Pontoporia setosa*, Sibr., *Halimodon brevicatcar*, Goës., an annelid, a *Molgula*, *Yoldia intermedia*, Sars., *Yoldia* (?) *arctica*, Gray, and a *Solecurtus*." Off the mouth of the Lena River the interesting species *Idothea entomon*, Lin., and *Idothea Sabinei*, Kröyer, were found.

In the Arctic Ocean near Bering Strait and in Bering Sea, besides the fur seal, so scarce now, there is another (*Histriophoca fasciata*, Zimm.) which is marked with large beautiful

* Siberia and the Great Siberian Railway. p. 41.

white circles. Of the larger sea animals of this section, *Stegcephalus Kessleri*, *Sturb.*, *Sabinea septemcarinata*, *Sabine*, and *Acanthostephia Malmgreni*, *Goës.*, might be mentioned. Further south off Kamchatka there is found the so-called sea otter (*Enhydris lutris*, *Lin.*); the sea lion (*Eumetopias Stelleri*, *Lesson*), and the sea bear (*Otaria ursina*), which are nearly extinct; and the sea cow (*Rhytina Stelleri*, *Cuvier*), which is now extinct. Among the fish there is one specially interesting new species *Dallia delicatissima*, *Smidt*, which is related to the ordinary dogfish.

In Bering Sea and Strait the *Vega* Expedition found that hundreds of crabs (*Chionoecetes opilio*, *Kröyer*) were brought up with the dredge at almost every haul. Also the starfish (*Ophioglypha nodosa*, *Lütken*) and *Fusus deformis*, *Reeve* were very abundant. The phosphorescent crustacean (*Metridia armata*, *A. Boeck*) is of very striking interest. Norden-skjöld found this animal living on the Arctic shore where the sea beats over ice and snow beds whose temperature is near the freezing point of mercury. These are so numerous that when one walks over this snow-sludge on a dark day, or at night, a bright flash of light from their bodies accompanies each step. Their proper element seems to be snow-sludge soaked in sea water at a temperature of about 32° F. Their power to emit light ceases at 14° F., but a temperature of —22° F., does not kill the animal.

Western Siberia

On the plains of Western Siberia, and in the edges of the forests are many mammals which also penetrate the Arctic Tundra. Within the dense forests animal life is very scant, so little game is found here that hunters have traveled for days without seeing any. The principal mammalia living in the fringe of the forests and on the plains

"are the glutton (*Gulo borealis*, Nilss.), the common bear (*Ursus arctus*, L.), the very rare sable (*Mustela sibirica*, L.), the ermine (*Mustela erminea*, L.), the Siberian weasel (*Mustela sibirica*, Pall.), the common weasel (*Mustela vulgaris*, Ertl.), the otter (*Lutra vulgaris*, Erkl.), although rare, the wolf (*Canis lupus*, L.), the fox (*Canis vulpes*, L.), the black variety being only peculiar to the extreme north, the lynx (*Felis lynx*, L.), the elk (*Cervus alces*, L.), the flying squirrel (*Pteromys volans*, L.), the common squirrel (*Sciurus vulgaris*, L.), the striped squirrel (*Tamias striatus*, L.), and some small species of rodents. Finally on the low mountain ridges intersecting the polar and forest regions of Eastern Siberia, for instance, on the Severma chain, east of the Yenisei, under 67° north latitude, and on the mountains following the current of the Lower Tunguska, there are animals belonging to the mountain fauna, namely the mountain sheep (*Aegoceros montanus*, Desm.) and the musk (*Moschus moschiferus*, L.).

"On the Altai-Sayan elevations in Eastern and particularly Western Siberia, there are naturally species of such mammals as are not found on the Siberian plains. There are the alpine wolf (*Canis alpinus*, Pall.), two races of large cats (*Felis irbis*, Müll., and *Felis manul*, the *Chtonoergus alpinus*, *Spermophilus Eversmanni*), the alpine hare (*Lagomys alpinus*, Pall.), the stag (*Cervus elaphus*), and others." *

* Siberia and the Great Siberian Railway. p. 41.

The insect fauna of the plains is very similar to that of European Russia. But on the Altai Mountains the differentiation of the insect fauna, like that of the flora, becomes very great.

"The local forms of *Coleoptera* incapable of flight, are peculiarly eccentric; for example, species of *Carabus*, some of which are exceedingly rare: *Car. imperialis*, *Fisch.*, *Car. Regalis*, *Boeb.*, *Car. Gebleri*, *Fisch.*, *Car. Leachi*, *Fisch.*, *Car. Loschnikowii*, *Fisch.*, etc. and wingless wood-cutters (for example, *Dorcadium politum*, *Dalm.*), etc.

Eastern Siberia

In the Transbaikal region the mammalia are quite similar to those of Western Siberia, the great change being in the invertebrate fauna. "Very many of their forms, entirely absent from Siberia, as, for example, among the articulate animals, the river crayfish, appear upon the upper streams of the Amur system, of course with specific distinctions from the European (*Astacus Amurensis*)."

The approach to the sea is marked by the appearance of insects which are transitional forms from the continental to the littoral.

"Thus, for example, in the genus *Carabus* of the family of the *Coleoptera*, not possessing true wings under their brilliant elytra, the local elongated, comparatively narrow forms of the Subgenus *Coptolabrus* (species *Coptolabrus smaragdinus*, *Fisch.*), serve as the transition to the still more elongated forms of the Japanese subgenus of *Carabs damaster*.

"As regards the vertebrate fauna, with the more extensive regions of distribution of these animals, the Transbaikal fauna naturally shows incomparably more resemblance to the remaining fauna of Siberia.

Nevertheless, to the animals occurring over the whole forest zone of Eastern Siberia (*v. supra*), are added a few mountain forms of the Altai-Sayan system, steppe forms of Mongolia, and finally, animals breeding in the Amur territory and in Manchuria. To the first belong, the musk-deer (*Moschus moschiferus*, L.), roebuck (*Cervus capreolus*, L.), badger (*Meles taxus*, Schr.), polecat (*Mustela putorius*, L.), Eversmann's marmot (*Spermophilus Eversmanni*, Br.), and the rat hare (*Lagomys alpinus*, Pall.). To the second belong the corsak (*Canis corsac*, L.), steppe cat (*Felis manul*, Pall.), baibak (*Arctomys bobac*, Schr.), *Lagomys ogotona*, Pall., the jerboa (*Dipus jaculus*, Pall.) tolai (*Lepus tolai*, Pall.), two species of saiga (*Antilope gutturosa*, Pall., *Antilope crista*, Temm.), and finally, the kulan or dziggetai (*Equus hemionus*, Pall.). To the third belongs the Amur raccoon (*Canis procyonoides*, Gr.), a species of dur (*Cervus elaphus*, L.), and wild boar (*Sus scropha*, L.).

"The fauna of the birds which, from the very nature of their mode of locomotion, are capable of having the most extensive region of distribution, also here includes both northern and southern forms. To the first, for example, belong the capercaillie (*Tetrao urogallus*, L.), blackcock (*Tetrax tetrix*, L.), hazel-hen (*Tetrao bonasia*, L.), white and alpine ptarmigan (*Lagopus albus*, Gm., and *alpinus*, Nilss.); to the second, the steppe blackcock (*Syrhaptes paradoxus*, Pall.), black crane (*Grus monachus*, Temm.), and two more southern species of crane (*Grus leucogrammus*, Pall., and *Grus virgo*, L.), the blue magpie (*Pica cyanea*, Pall.), etc.

"In regard to snakes and other reptiles, on the whole occurring so rarely in Northern Siberia, the Transbaikalian country is comparatively rich. Besides the harmless snake (*Coluber rufodorsatus*, Cant.) and (*Elaphis diene*, Pall.), there are here to be met with the extremely venomous varieties *Trigonocephalus intermedius*, Strauch, and *Trigonocephalus Blomhoffii*, Boje. Finally, the piscine fauna, on crossing the

Yablonoi range into the system of the Amur, completely alters its character (*v. infra*).” *

Among the invertebrate fauna as the Sea of Japan is approached, “a few forms appear not found in the Amur country and bearing a sub-tropical character,” also

“the proportion increases of purely European species or their analogues, a fact particularly noticeable in those orders of insects possessing a highly developed power of flight, as for example, the butterflies and moths (*Lepidoptera*). On the whole, both the flora and the fauna of the Usuri country, as also of the whole Amur-Littoral region, bear a completely palearctic character, that is, the character of the northern zone of the Old World, here reaching as far as the Eastern Ocean; while in the more southern zone the palearctic fauna crossing the whole tableland of Central Asia and Tibet together finds its limit in a more western meridian upon the frontier of the warm sub-tropical plains of China, falling far short of the Eastern Ocean.

“The vertebrate animals of the Usuri-Littoral country are the same as those in Amuria; only one species of deer (*Cervus axis*), a few small rodents, and fish in the Sea of Japan appearing in its bays like the herrings and pilchards in countless numbers at certain seasons of the year, constitute the difference between the fauna of the Usuri-Littoral region and that of the Amur.” †

In the Kamchatkan region among the mammals are the bear (*Ursus arctos*, L.), the badger (*Meles taxus*, Schr.), the glutton (*Gulo borealis*, Nilss.), the Russian sable (*Mustela zibellina*, L.) and several other species of the *Mustela*, among

* Siberia and the Great Siberian Railway. pp. 58-59.

† Ibid. p. 69.

which is found the species *Flavigula*, common only to Japan and the northeast coast of Asia, the European otter (*Lutra vulgaris*, *Erxl.*), several species of wolf, the European shrew, three species of deer (*Cervus alces*, *L.*, *C. tarandus*, *L.*, and *C. capreolus*, *L.*) and the musk-deer (*Moschus moschiferus*, *L.*).

The birds of Kamchatka, according to the list in the Russian Government report on the "Okhotsk-Kamchatka Region," number 263 species of which twenty-eight belong to the *Rapaces*, ninety-four to the *Passeres*, twelve to the *Scansores*, one to the *Columbidae*, seven to the *Gallinaceae*, thirty-nine to the *Grallatores*, and eighty-two to the *Natatores*. Of these five are found only along the northeast coast of Asia. Four of them (*Cinclus Pallasii*, *Temm.*, *Motacilla lugens*, *Kittl.*, *Corvus macrorhynchus japonensis*, *Tacz.*; and *Pyrrula rosacea*, *Seeb.*) are *Passeres*. The other one, common only to this part of Asia, is the species of *Scansores*, (*Gecinus canus*, *Gm.*).

From the lists in the Russian Government report on Manchuria, a few facts of interest might be mentioned concerning the fauna of the North Pacific coast of Asia. Of the fifty-five species of Mammals found in Manchuria, fifty are common to the Amur provinces; forty-three to the Maritime Province; thirty-eight to China, Japan, and Korea; thirty-eight to Eastern Mongolia; thirty-seven to Eastern Siberia; fifteen to Arctic Siberia; and twenty-seven to Europe. In Manchuria there are 268 species of birds, of which 238 are common to the Amur provinces; 259 to the Maritime Province; 230 to

China, Japan, and Korea; 194 to Eastern Mongolia; 173 to Eastern Siberia; 70 to Arctic Siberia; and 111 to Europe.

Turkestan and the Steppes

In marked contrast to the fauna of all the sections of Asiatic Russia thus far described, stands that of Turkestan. Shut off by snow-clad mountains on the south and by arid desert wastes on the north, its faunal development has been peculiar and interesting. For the collections from which most of our knowledge of the fauna of Turkestan has been derived, we are indebted to Professor A. P. Fedchenko, who with his wife spent the years from 1868 to 1871 in making zoological collections in Turkestan. His energy and enterprise can be judged from the fact, that, during his first trip in the Zerafshan Valley, during four months he collected 7,800 zoological specimens, comprising 1,700 different species. Later, during a more extended trip, he collected 57,000 specimens, among which there were over 5,000 species of animals.

Professor Fedchenko laid great plans for identifying his specimens and drawing generalizations from the results, but unfortunately he died with his work but scarcely started. Henry Lansdell in the second volume of his book on "Russian Central Asia" (pages 506-617) gives the lists of Fedchenko's collections as identified and enlarged by different scientists. To this we are indebted for the following facts on the fauna of Turkestan.

Before taking up Turkestan proper, however, it may be

well to consider the fauna of the Kirghiz Steppe, which is a sort of middle ground between the Siberian and Turkestan faunas.

"The fauna of the invertebrates in the Kirghiz Steppe region is as peculiar and original as the flora. The difference between it and that of Western Siberia and European Russia is striking. On the other hand it is beyond doubt that this fauna differs very little from that of the deserts and steppes of the Aral-Caspian depression. The fauna of the sub-mountainous zone presents quite a different character, bearing a close resemblance to that of Turkestan and the Pamir. Among the coleopterous insects, not only of the sandy desert of the steppe zone, but throughout the whole of it, the sluggishly moving *Tenebrionidae*, without wings under their hard coherent elytra, predominate. On the contrary, in the mountainous zone of the Tian-Shan and Ala-tau, as in the dry steppe, the *Tenebrionidae*, are met with in smaller numbers, while here occur numerous kinds of *Cara-bidae*, among which are very rare mountain forms characteristic of the Central Asiatic mountainous zones.

"Of the vertebrates a great number of birds come during winter from the far north, and nestle in the steppe and sub-mountainous regions. The ornithological fauna of this region is especially rich. In the warm valleys exist different species of fowls, as also the most beautiful sorts of Asiatic pheasants; on the rivers and lakes is found a great variety of birds, native of the Mediterranean basin, among which are covies of pelicans; and on the alpine zone, numbers of mountainous birds, the greater part of which are natives of the Asiatic mountains.

"Even the fauna of the mammals is much richer and more varied than in Siberia. The tiger and the *irbis* (*Felis irbis*) reach the northern limit of their distribution in the reeds of Balkash, but occasionally stray northward into the neighborhood of the Ala-tau. Wild boars

occur in all the sub-mountainous zone, in the Tian-Shan and Trans-Iliian Ala-tau. There are two species of bear belonging to the Pamir and the range of the Himalaya (*Ursus thibetanus* and *isabellinus*). Besides the *arkhar* (*Ovis argali*), extremely common in the alpine and subalpine zones of the Tian-Shan and both Ala-tau, the *kochgar*, (a mountain sheep first described by the celebrated traveler, Marco Polo, and subsequently called in his honor, *Ovis Poli*, from the horns and skeletons found in abundance on the Pamir), breeds in the wildest parts of the Tian-Shan. This species was long considered extinct, until discovered by the most recent Russian travelers, Semenov, Sievertsov, and Przhevalsky. In the mountainous zone of the sub-mountainous region also breed the *Cervus pygargus*, *Capra sibirica*, several species of Saiga (for example, *Antelope subgutturosa*) and the porcupine (*hystrix*); while the steppe zone contains kulans (*Equus hemionus*).” *

Still further south in Turkestan the difference from the European fauna is even more marked. Out of the eighty-three mammals described, there are five new species entirely peculiar to this region; *Plecotus leucophaeus*, Aryan mouse (*Mus wagneri major*), *Meriones Collium*, *Lagomys rutilus*, and *Lepus Lehmanni*.

Among the birds (*Aves*) there are nine new species out of the 384 mentioned; *Falco Tscherniaievi*, *Saxicola melanogenys*, *Salicaria macronyx*, *S. eurhyncha*, *S. sphenura*, *S. tamariceti*, *S. concolor*, *Cettia fusca*, *Acridiornis straminea*.

Among the fishes (*Pisces*) there are fourteen new species out of the forty-two mentioned: *Scaphirhynchus Fedchenkoi*, *Kessl.*, *Capoeta Steindachneri*, *Kessl.*, *Barbus lacertoides*,

* Siberia and the Great Siberian Railway. pp. 82-83.

Kessl., *Oreinus euryalomus*, *O. minutus*, *Schizothorax Fedchenkoi*, *S. Aksaiensis*, *Diptychus Severzovi*, *Squalius intermedius*, *S. squaliusculus*, *Alburnus iblioides*, *Acanthobrama Kuschakewitschi*, *Cobitis longicauda*, and *C. uranoscopus*.

There are fifty species of *Mollusca* found in Turkestan, and twenty-six of them are characteristic of the region. Of the 146 species of spiders (*Araneae*) sent to Alexander Kroneberg for identification, he found forty-five new species.* Among the fifty-one species of *Crustaceae* in Fedchenko's collection there are seventeen species which are new; one *Amphipoda*, seven *Isopoda*, eight *Copepoda*, and one *Cladocera*.† The land *Crustaceae* are only represented by the one genus, *Porcellio*. The beetles (*Coleoptera*) of Turkestan, according to S. M. Solsky's list, have 128 new species and one new genus (*Oxycorythus*), most of which were described by Solsky.§ Fedchenko's collection of bees (*Melliferae*) is remarkably interesting, though he died before having described any of them except the *Anthophora*, and Ferdinand Moravitz completed the work. This full list contains 438 species, of which 282 are new, and also one of the genera (*Stelidomorpha*), under the *Anthidium*.

The wasps (*Sphegidae*) furnish forty-two genera, three of which are new. Of the *Sphegidae* there are twenty-three species, eight of which are new; of the *Pompilidae* there are forty species, eighteen of which are new; of the *Larridae*

* For list see Russian Central Asia. Vol. 2. pp. 543-547.

† Ibid. pp. 548-556.

§ Ibid. pp. 552-561.

twenty species, ten of which are new; under the *Nyssoniidae* are found the two new genera, *Olga Rad.* and *Kaufmannia Rad.*, also eighteen new species out of the twenty-eight; eight out of the eleven *Bembecidae* are new species; seventeen of the thirty-five species of *Philanthidae* are new; and under the *Crabronidae* there is one new genus *Oxybeloides*, and also fourteen new species out of the twenty-nine.

Among the ants (*Formicidae*) there are seven new species out of thirty-six. The butterflies and moths (*Lepidoptera*) of Turkestan have been studied by Nicholas G. Erschoff, whose conclusions are the following:

"Concerning the character of the fauna of Turkestan *Lepidoptera* the collections made there permit some deductions, but only very general ones to be drawn. In all there are known, 367 species in Turkestan. Of these, ninety-two, or twenty-five per cent, constitute new species, and fourteen, or four per cent, appear there in new forms, some of which will in the future probably be regarded as independent species, and twenty-five species, according to present information, must, with the new species, be recognized as peculiar to the fauna of Turkestan."

"Respecting the position that the fauna of Turkestan should occupy in the fauna of European territory, it may be without hesitation assigned to the south, or so-called Mediterranean province. The 261 known species, or seventy-one per cent of the whole fauna of Turkestan, as is seen from the list, represent a mixture of the species of Asia Minor, with Southern European and steppe species of the Volga and Ural."

"The following are particularly interesting from a geographical point of view: *Plusia Hochenwarthi*, *Hochenw.*, previously found only

in Lapland, Scandinavia, Switzerland, and Labrador; *Hypena revolutalis*, Z., first found in Caffraria, then in Syria and Persia; *Phasiane Rippertaria*, Dup., only to be found elsewhere in Provence, in the south of France; *Eurycreon mucosalis*, H. S., allotted to the Balkan Peninsula; and *Staintonia medinella*, Stgr., known only in Andalusia; but all now found in Central Asia." *

Mr. Robert MacLachlan observes concerning the *Neuroptera* that its fauna is "thoroughly marked European" in character. The most interesting of them are the *Planipennia*, which contains seventeen new species and one new genus.

The *Orthoptera* collected by Fedchenko were identified by H. De Saussure, who says:

"The Orthopterus fauna of Turkestan presents a very strange resemblance to the European fauna; it is particularly like the fauna of South Russia, and contains a large quantity of West-European species. It is distinguished not so much by forms exclusively peculiar to it, as by the concurrence of species which are not found together in other countries. This fauna, together with that of the Caspian, South-Siberian and Aral steppes, and probably that of Asia Minor, might be called the 'fauna of the Asiatic steppes.'" †

Extinct Fauna of Northern Siberia

A chapter on the fauna of Siberia would not be complete without some reference to the Post-Tertiary mammals which did not become extinct till after the advent of man into the region. These remarkable remains, especially of the mammoth,

* Russian Central Asia. Vol. 2. pp. 583-584. For complete list see pp. 581, 595.

† Ibid. p. 613.

are so numerous that the principal industry along the northern rivers and on the New Siberian Islands has been the ivory trade. An idea of the enormous number of these remains can be gained from some of the reports on the ivory exported. In 1840 Middendorff calculated that during the previous two hundred years, 20,000 mammoths had been discovered. Reclus speaks of the annual output of ivory as fifteen tons, which represents the tusks of about two hundred animals; while Stadling says that at the present time there are seventeen tons of ivory taken out annually in the Yakutsk district alone.

The most important and interesting of these mammals found are the mammoth (*Elephas primigenius*, B.), and two varieties of rhinoceros (*Rhinoceros antiquitatis*, Blumb., and *Rhinoceros Maerckii*, Jäg.). A carcass of the former was found frozen in the tundra of the Yakutsk district so well preserved that the skin and long red hair, with which it was covered, were in perfect condition, and showed well its difference from the practically hairless elephants living at present in the warm regions of India and Africa. One of these well-preserved carcasses found in Yakutsk, the skeleton of which is now in the Museum at St. Petersburg, was exhumed by Mr. Adams of the St. Petersburg Academy in 1806, who found that the

“entire carcass measured nine feet four inches high, and sixteen feet four inches from the point of the nose to the end of the tail, without including the tusks, which were nine feet six inches in length if measured along the curves. The two tusks weighed 360 pounds, and the head and tusks together 414 pounds. The skin was of such extraordinary weight that ten persons found great difficulty in carrying it.

About forty pounds of hair, too, were collected, though much more of this was trodden into the sand by the feet of bears which had eaten the flesh." *

Prof. Henz of the St. Petersburg Zoological Museum who discovered last September near the Ebrosowka, Siberia, the remains of a mammoth, states in a recent letter sent from Snedni Salymusk, Siberia, that the mammoth is on the road to St. Petersburg on a 100 pack sledge escorted by a troop of Cossacks, and will probably reach its destination about the first of May. It is undoubtedly the most perfect specimen ever recovered. He describes his great *find* as follows:

"Above all, it is all there; for, while the bears and wolves tore some of the minor bones from their moorings, they were powerless, or unwilling, to carry them off. I am certain I got away with all the bones, being more fortunate in that respect than Mr. Adams, whose fossil mammoth, now in the Imperial Museum, lacks one hind foot. Aside from the bones, I collected enough of the flesh and coat to allow the most thorough scientific investigation. I believe that it is the most perfect specimen of fossil flesh and skin ever shown in a scientist's laboratory, and after our authorities have passed on it we will be able to decide, approximately at least, whether the story that the Alaska Indians greased their boats with mammoth fat attached to a skeleton found on the bank of the Yukon, can be credited or not. I say right here that it is not impossible, even though I found no traces of fat on or about the carcass I dug up myself.

"I secured large portions of the skin of this monster, aside from that attached to the one perfect leg—the fragments show that the creature was so clothed as to be able to withstand the utmost cold—that does away with the theory that the bones were swept to this place by the

* Through Siberia, by Henry Lansdell. Vol. I. p. 290.

deluge. The hairy coat is extremely thick, thicker than that on the neck of a bull buffalo. Its average length is seven inches, but the mane must have been five or six times as long. It is thicker than horse hair, of dark brown color, lighter at the hoofs. At that point, too, it grows luxuriously, as is sometimes the case with horses of coarse breed.

"The hair described belongs to the outer coat and is stiff and wiry, calculated to throw off wet and wind. Under this grows a wool, very closely, and from five to ten centimetres thick. Like the covering of a young camel, the wool is of a light yellow color. It would be impossible for an animal so protected to feel even the extremest cold.

"Up to now we had absolutely nothing to guide us in searching for the period when the mammoth became extinct, particularly as regards Siberia and North America, where the theory that this giant was exterminated by early man, obviously doesn't apply, as in both hemispheres there were, and are, vast territories never trodden by man's foot. I am now inclined to think that the mammoth perished of starvation, when overtaken by a period of ice and flood. This, however, did not happen to my mammoth, as we will presently see.

"As already stated, foxes, bears, and wolves relieved me of the necessity of carting away the greater portion of flesh and skin, but, happily, they left the stomach undisturbed, permitting me to secure this important organ intact. Seeing that, curiosity got the best of me—I couldn't resist the temptation to investigate. Let scientists rejoice, the stomach is full of undigested food—now we will learn positively whether or not the mammoth could live in prehistoric Siberia, Europe, and North America. The food in the stomach will settle the question once and for all. It is very considerable in quantity, and more is found on the tongue and between the teeth.

"My mammoth undoubtedly died during the pleasant occupation of feeding. He probably rolled off a precipice while reaching out for a coveted branch or plant; the position of his forelegs shows that almost to a certainty. The left one is bent into a semi-curve, indicating that

the ponderous and unwieldy animal tried in vain to climb upward, while his right foot was struggling to maintain a hold, but the soil or rock, presumably, was slippery or too steep to afford a safe foothold for so large a beast. In gliding down the mountain-side, the animal's hind legs were forced into a horizontal position and got under his body, which circumstance made it completely impossible for the mammoth to raise himself by his own efforts.

"The impromptu grave into which the animal plunged was made of sand and clay, and his fall probably caused masses of neighboring soil to loosen and cover him completely. This happened in the late fall, or at the beginning of winter, to judge by the vegetable matter found in the stomach; at any rate, shortly afterward the grave became flooded, ice following. This completed the cold storage, still further augmented by vast accumulations of soil all around—a shell of ice, hundreds of feet thick, inclosed by yards upon yards of soil, that remained frozen for the greater part of the year. Thus the enormous carcass was preserved, for how long no one knows.

"As to measurements, exact figures cannot be given at the present time. I am inclined to think that my mammoth, when mounted will exceed in height the most famous specimens known, that at St. Petersburg and the other in Chicago. The first measures nine feet three inches, the latter nine feet eight inches in height."

Besides the mammoth and rhinoceros mentioned above, there are many remains of the bison, horse, tiger, saiga, and the wapiti, found in such positions as to prove without doubt that they lived where they were found, even as far north as 74° N. Lat., while now none of them live north of 60° N. Lat. The remains of animals found by the German Academy of Science expedition to the region at the mouth of the Yana River and the New Siberian Islands, in 1885 and 1886 includes

the following as mentioned by J. D. Tscherski in his report; *Felis tigris*, *Canis lupus*, *Canis familiaris*, *Vulpes lagopus*, *Gulo luscus*, *Ursus maritimus* and *arctos*, *Proca foetida*, *Trichechus rosmarus*, *Spermophilus Eversmanni*, *Lemmus obensis*, *Cuniculus torquatus*, *Lepus variabilis*, *Bison priscus*, *Ovibus moschatus*, *Ovis nivicola*, *Colus saiga*, *Alces palmatus*, *Rangifer tarandus*, *Cervus canadensis*, var. *maral*, *Equus caballus*, *Rhinoceros tichorhinus*, and *Elephas primigenius*.

The distribution of the mammoth and his final extinction have been, as remarked in a previous chapter, the ground for many theories as to the climatic conditions of the Northern Hemisphere during Pleistocene time. It is now generally believed that the species originated in northern India, and from there migrated to the north and spread out till his habitat extended from England and France, across Europe and Asia into North America, where his remains have been found as far south as Mexico, and as far east as New York. The signs of land elevation make it probable that they reached North America by land or archipelago connection in Bering Sea. The climate was probably more mild and equable at that time than at present, so that the northern limit of trees was much further north. In fact, the stomachs of some of the mammoths have been found containing leaves of trees whose present habitat is hundreds of miles south of the locality where the animal perished.

James Geikie suggests as one of the causes of their extinction in Northern Siberia that they were mired in the tundra in the following manner. During the glacial epoch great

snowdrifts accumulated and became consolidated. Over this ice, mosses and lichens crept until a tundra was formed over solid ice, a condition now to be noted in places. Later this ice in places might melt away leaving the tundra apparently firm. In such traps as these many of the great animals might be caught and perish.

Mr. Robert Bell,* who has spent a great amount of time in the northern parts of North America, has studied the present migrations and catastrophes which befall whole herds of the larger mammals of the north, and arrived at the following theory as to the extinction of the Mammoths.

He notes that the reindeer and arctic fox make great annual migrations, while the Canadian lynx migrates according to the food supply. The American bison used to make great annual migrations. Also "the moose, or American elk (*Alces americanus*), migrates slowly from one large area to another through periods extending over many years." Judging from this, it seems probable that during the milder period of their time the mammoth in Siberia spent their winters in the forest belt, and came north to the tundra region and the shores of the Arctic Ocean during the summer. This annual migration from forest to tundra, in the case of the deer at present, was noted in the previous chapter on the Arctic Littoral, where mention was made of the vast herds of reindeer which annually swim to the islands of the Lena delta in the early summer to escape

* "On the Occurrence of Mammoth and Mastodon Remains around Hudson Bay," Bulletin of the Geological Society of America. Vol. 9. pp. 369-390.

the flies and mosquitoes of the mainland, and then return before the ice forms to spend the winter in the edge of the forest belt.

Mr. Bell thinks that as the climate gradually became more and more severe, and the summers shorter and shorter, the inertia of this migratory spirit continued, and large herds of mammoth from time to time were caught in the fearful blizzards, so common now during the early autumn in Northern Siberia, and perished from cold and hunger. At times now large herds of deer are killed in our Northwest country by such blizzards, especially when a crust forms over the snow so that their food supply of lichens is cut off. On Okpatok Island, which once swarmed with reindeer, such a crust formed over the snow and continued so long that the whole herd perished of starvation—and the island has never been restocked.

Another circumstance which might have hastened their extinction may have been in the breaking of the ice when large herds were crossing the rivers in the late autumn or early winter. This was a common occurrence in the plains of our west when great herds of bison were crossing the rivers.

All these circumstances, together with the advent of man, may well have been the cause of their extinction. That man appeared before the mammoth disappeared is shown by the occurrence of the human implements already alluded to in the same deposits at Irkutsk and Tomsk, Siberia.

THE END

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